

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE W02B0004		PAGE 1 OF 1 PAGES	
2. AMENDMENT/MODIFICATION NO. 0003		3. EFFECTIVE DATE 29 November 2002		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. (If applicable)	
6. ISSUED BY LOS ANGELES DISTRICT, COE CESPL-CT-WEST REGION BRANCH P.O. BOX 532711 LOS ANGELES, CA 90053-2325		CODE		7. ADMINISTERED BY (If other than Item 6)		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)				(✓)		9A. AMENDMENT OF SOLICITATION NO. DACW09-02-B-0004	
				X		9B. DATED (SEE ITEM 11) 17 OCTOBER 2002	
						10A. MODIFICATION OF CONTRACTS/ORDER NO.	
						10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE					

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☒ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☒ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(✓)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

**PRADO DAM EMBANKMENT AND OUTLET WORKS,
RIVERSIDE COUNTY, CA**

This amendment is issued to:

- a. REVISE SF1442 - Solicitation, Offer, and Award
- b. REPLACE 00100.pdf with 00100_3.pdf; SECTION 00100, INSTRUCTIONS TO BIDDERS
- c. REPLACE 03305.pdf with 03305_3.pdf; SECTION 03305, CAST-IN-PLACE STRUCTURAL CONCRETE

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
_____ (Signature of person authorized to sign)		BY _____ (Signature of Contracting Officer)	

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**SOLICITATION, OFFER,
AND AWARD***(Construction, Alteration, or Repair)*

1. SOLICITATION NO.

DACW09-02-B-0004

2. TYPE OF SOLICITATION

☒ SEALED BID (IFB)☐ NEGOTIATED (RFP)

3. DATE ISSUED

29 November 2002

PAGE OF PAGES

IMPORTANT - The "offer" section on the reverse must be fully completed by offeror.

4. CONTRACT NO.

5. REQUISITION/PURCHASE REQUEST NO.

6. PROJECT NO.

Prado Dam Embankment and Outlet Works

7. ISSUED BY

CODE

U.S. Army Corps of Engineers
Los Angeles District, West Region Branch
P. O. Box 532711, CESPL-CT-W
Los Angeles, CA 90053-2325

8. ADDRESS OFFER TO

U.S. Army Corps of Engineers
Los Angeles District, West Region Branch
P. O. Box 532711, CESPL-CT-W
Los Angeles, CA 90053-2325

9. FOR INFORMATION



A. NAME

Cindy Myrtetus

B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS)

213/452-3247; cynthia.h.myrtetus@usace.army.mil

SOLICITATION**NOTE:** In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS (Title, identifying no., date):

PRADO DAM EMBANKMENT AND OUTLET WORKS, RIVERSIDE COUNTY, CALIFORNIA

This project consists of raising the existing earthen dam approximately 28' and the construction of a new gated outlet works. Work will include earth & rock work, construction of concrete control tower & channel structures, steel access bridge, mechanical, plumbing & electrical work for the control structure, fabrication & installation of regulating outlet gates, instrumentation, demolition of the existing control tower, sewer line relocation, site clearing, excavation and fill, A.C. paving and appurtenant work. The estimated cost range of the project is between \$25,000,000.00 and \$100,000,000.00.

This is an UNRESTRICTED procurement; all responsible sources may submit an offer.

This amendment is issued to reference new specifications as indicated on SF30, attached*

The bid opening date remains 6 February 2003.

* Denotes items changed.

11. The Contractor shall begin performance within _____ * calendar days and complete it within _____ * calendar days after receiving	
<input type="checkbox"/> award,	<input checked="" type="checkbox"/> notice to proceed. This performance period is <input checked="" type="checkbox"/> mandatory, <input type="checkbox"/> negotiable. (See * SECTION 00800 .)
12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS? (If "YES," indicate within how many calendar days after award in Item 12B.)	
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	12B. CALENDAR DAYS 10

13. ADDITIONAL SOLICITATION REQUIREMENTS:

A. Sealed offers in original and 0 copies to perform the work required are due at the place specified in Item 8 by 1:00 pm (hour) local time 06 FEBRUARY 2003 (date). If this is a sealed bid solicitation, offers will be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

B. An offer guarantee ☒ is, ☐ is not required.

C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.

D. Offers providing less than 60 calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.

OFFER (Must be fully completed by offeror)

14. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)

15. TELEPHONE NO. (Include area code)

16. REMITTANCE ADDRESS (Include only if different than Item 14)

CODE

FACILITY CODE

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within _____ calendar days after the date offers are due. (Insert any number equal to or greater than the minimum requirement stated in Item 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.

AMOUNTS

SEE PRICE SCHEDULE

18. The offeror agrees to furnish any required performance and payment bonds.

19. ACKNOWLEDGMENT OF AMENDMENTS

(The offeror acknowledges receipt of amendments to the solicitation - give number and date of each)

AMENDMENT NO.

DATE

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER
(Type or print)

20B. SIGNATURE

20C. OFFER DATE

AWARD (To be completed by Government)

21. ITEMS ACCEPTED:

22. AMOUNT

23. ACCOUNTING AND APPROPRIATION DATA

24. SUBMIT INVOICES TO ADDRESS SHOWN IN
(4 Copies unless otherwise specified)

ITEM

25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO

☐ 10 U.S.C 2304(c) ()☐ 41 U.S.C 253(c) ()

26. ADMINISTERED BY

CODE

27. PAYMENT WILL BE MADE BY

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28. NEGOTIATED AGREEMENT Contractor is required to sign this document and return _____ copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all work requirements identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications incorporated by reference in or attached to this contract.

☐ 29. AWARD (Contractor is not required to sign this document.) Your offer on this solicitation is hereby accepted as to the items listed. This award commutes the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN (Type or print)

31A. NAME OF CONTRACTING OFFICER (Type or print)

30B. SIGNATURE

30C. DATE

31B. UNITED STATES OF AMERICA

31C. AWARD DATE

BY

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Section 00100

52.0000-4010 INQUIRIES

Perspective bidders/offerors should submit inquiries related to this solicitation by writing or calling the following (collect calls will not be accepted:

(1) For inquiries of a contractual nature (solicitation requirements, interpretation of contractual language) call:

Cindy Myrtetus

213-452-3247

For bid results only, call (213) 452-3235.

(2) All technical questions on the specification or drawings will be submitted in writing to:

Address:

USAED – Los Angeles District, ATTN: Steve Vaughn

P. O. Box 532711, ED-DA

Los Angeles, CA 90053-2325

Phone Number 213-452-3638

Facsimile Number: 213-452-4248

(3) Please include the solicitation number, project title and location of project with your questions. Written inquiries must be received by this office not later than 14 calendar days prior to bid opening date/date set for receipt of offers.

(4) Oral explanations or instructions are not binding. Any information given to a bidder/offeror which impacts the bid/offer will be given in the form of a written amendment to the solicitation.

52.0000-4023 SAFETY REQUIREMENTS

The bidder's attention is directed to the latest version of U.S Army Corps of Engineers Safety and Health Manual, EM 385-1-1, which will be strictly enforced. This publication may be obtained from the US Army Engineer District, Los Angeles, ATTN: Safety Office, P.O. Box 532711, Los Angeles, California 90053-2325.

52.0001-4004 BID RESULTS

The telephone number for bid results after the opening is Area Code (213) 452-3245.

52.211-2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE DOD INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) AND DESCRIPTIONS LISTED IN THE ACQUISITION MANAGEMENT SYSTEMS AND DATA REQUIREMENTS CONTROL LIST, DOD 5010.12-L (DEC 1999)

Copies of specifications, standards, and data item descriptions cited in this solicitation may be obtained--

(a) From the ASSIST database via the Internet at <http://assist.daps.mil>; or

(b) By submitting a request to the--Department of Defense Single Stock Point (DoDSSP), Building 4, Section D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Telephone (215) 697-2667/2179, Facsimile (215) 697-1462.

(End of provision)

52.214-1 SOLICITATION DEFINITIONS--SEALED BIDDING (JUL 1987)

"Government" means United States Government.

"Offer" means "bid" in sealed bidding.

"Solicitation" means an invitation for bids in sealed bidding.

(End of provision)

52.214-3 AMENDMENTS TO INVITATIONS FOR BIDS (DEC 1989)

(a) If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.

(b) Bidders shall acknowledge receipt of any amendment to this solicitation (1) by signing and returning the amendment, (2) by identifying the amendment number and date in the space provided for this purpose on the form for submitting a bid, (3) by letter or telegram, or (4) by facsimile, if facsimile bids are authorized in the solicitation. The Government must receive the acknowledgment by the time and at the place specified for receipt of bids.

(End of provision)

52.214-4 FALSE STATEMENTS IN BIDS (APR 1984)

Bidders must provide full, accurate, and complete information as required by this solicitation and its attachments. The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

(End of provision)

52.214-5 SUBMISSION OF BIDS (MAR 1997)

(a) Bids and bid modifications shall be submitted in sealed envelopes or packages (unless submitted by electronic means) (1) addressed to the office specified in the solicitation, and (2) showing the time and date specified for receipt, the solicitation number, and the name and address of the bidder.

(b) Bidders using commercial carrier services shall ensure that the bid is addressed and marked on the outermost envelope or wrapper as prescribed in subparagraphs (a)(1) and (2) of this provision when delivered to the office specified in the solicitation.

(c) Telegraphic bids will not be considered unless authorized by the solicitation; however, bids may be modified or withdrawn by written or telegraphic notice.

(d) Facsimile bids, modifications, or withdrawals, will not be considered unless authorized by the solicitation.

(e) Bids submitted by electronic commerce shall be considered only if the electronic commerce method was specifically stipulated or permitted by the solicitation.

52.214-6 EXPLANATION TO PROSPECTIVE BIDDERS (APR 1984)

Any prospective bidder desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must request it in writing soon enough to allow a reply to reach all prospective bidders before the submission of their bids. Oral explanations or instructions given before the award of a contract will not be binding. Any information given a prospective bidder concerning a solicitation will be furnished promptly to all other prospective bidders as an amendment to the solicitation, if that information is necessary in submitting bids or if the lack of it would be prejudicial to other prospective bidders.

(End of provision)

52.214-7 LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS OF BIDS (NOV 1999)

(a) Bidders are responsible for submitting bids, and any modifications or withdrawals, so as to reach the Government office designated in the invitation for bids (IFB) by the time specified in the IFB. If no time is specified in the IFB, the time for receipt is 4:30 p.m., local time, for the designated Government office on the date that bids are due.

(b)(1) Any bid, modification, or withdrawal received at the Government office designated in the IFB after the exact time specified for receipt of bids is "late" and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late bid would not unduly delay the acquisition; and--

(i) If it was transmitted through an electronic commerce method authorized by the IFB, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of bids; or

(ii) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of bids and was under the Government's control prior to the time set for receipt of bids.

(2) However, a late modification of an otherwise successful bid that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

(c) Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the bid wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

(d) If an emergency or unanticipated event interrupts normal Government processes so that bids cannot be received at the Government office designated for receipt of bids by the exact time specified in the IFB and urgent Government requirements preclude amendment of the IFB, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

(e) Bids may be withdrawn by written notice received at any time before the exact time set for receipt of bids. If the IFB authorizes facsimile bids, bids may be withdrawn via facsimile received at any time before the exact time set for receipt of bids, subject to the conditions specified in the provision at 52.214-31, Facsimile Bids. A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for receipt of bids, the identity of the person requesting withdrawal is established and the person signs a receipt for the bid.

(End of provision)

52.214-9 Failure to Submit Bid. (JUL 1995)

Recipients of this solicitation not responding with a bid should not return this solicitation, unless it specifies otherwise. Instead, they should advise the issuing office by letter, postcard, or established electronic commerce methods, whether they want to receive future solicitations for similar requirements.

52.214-18 PREPARATION OF BIDS--CONSTRUCTION (APR 1984)

(a) Bids must be (1) submitted on the forms furnished by the Government or on copies of those forms, and (2) manually signed. The person signing a bid must initial each erasure or change appearing on any bid form.

(b) The bid form may require bidders to submit bid prices for one or more items on various bases, including--

- (1) Lump sum bidding;
- (2) Alternate prices;
- (3) Units of construction; or
- (4) Any combination of subparagraphs (1) through (3) above.

(c) If the solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "no bid" in the space provided for any item on which no price is submitted.

(d) Alternate bids will not be considered unless this solicitation authorizes their submission.

52.214-19 CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION (AUG 1996)

(a) The Government will evaluate bids in response to this solicitation without discussions and will award a contract to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the Government, considering only price and the price-related factors specified elsewhere in the solicitation.

(b) The Government may reject any or all bids, and waive informalities or minor irregularities in bids received.

(c) The Government may accept any item or combination of items, unless doing so is precluded by a restrictive limitation in the solicitation or the bid.

(d) The Government may reject a bid as nonresponsive if the prices bid are materially unbalanced between line items or subline items. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated in relation to cost for other work, and if there is a reasonable doubt that the bid will result in the lowest overall cost to the Government even though it may be the low evaluated bid, or if it is so unbalanced as to be tantamount to allowing an advance payment.

52.214-34 SUBMISSION OF OFFERS IN THE ENGLISH LANGUAGE (APR 1991)

Offers submitted in response to this solicitation shall be in the English language. Offers received in other than English shall be rejected.

(End of provision)

52.214-35 SUBMISSION OF OFFERS IN U.S. CURRENCY (APR 1991)

Offers submitted in response to this solicitation shall be in terms of U.S. dollars. Offers received in other than U.S. dollars shall be rejected.

(End of provision)

52.0214-4001 DIRECTIONS FOR SUBMITTING BIDS (MAR 2002)

Envelopes containing bids must be sealed, marked and addressed as follows:

MARK ENVELOPES:

Bid under IFB No. **DACW09-02-B-0004**
Bid Opening Date: **FEBRUARY 06, 2003 AT 1:00 pm**

ADDRESS ENVELOPES TO:

Department of the Army
U. S. Army Engineer District, Los Angeles
ATTN: Contracting Division
C/O: CINDY MYRTETUS
P. O. Box 532711
Los Angeles, CA 90053-2325

SPECIAL INSTRUCTIONS PERTAINING TO HAND-CARRIED BIDS:

Due to security precautions, all Corps of Engineers visitors/couriers are now required to check in at the Public Affairs Office (PAO), Suite 980, Wilshire Blvd, Los Angeles, CA. Bidders are no longer permitted to hand-carry their bids directly to Contracting Division without an authorized escort. **Bids may NOT be left unattended at the Public Affairs Office (PAO), Suite 980.**

Bidders who desire to hand-deliver their bids prior to the scheduled bid opening time/date must notify the Contracting Division to arrange for receipt of their bid by Contracting Division personnel. Normally the contact will be the Contract Specialist designated above. In the event the Contract Specialist cannot be reached, please call the main Contracting Division telephone number, 213-452-3231 or the following alternative telephone numbers -3233, -3245, -3234, or -3235, in order to request assistance.

30 minutes prior to the scheduled bid opening time/date, the Bid Opening Officer will be in the Public Affairs Office (PAO) Suite 980, to accept bids. After visitor in-processing, all bidders will subsequently be escorted to Bid Opening Room, where the bids will be publicly opened and read.

In order to expedite visitor processing, bidders are encouraged to complete the information requested on the Notice of Visitor(s) Form (attached). The completed form can be faxed to the Contract Specialist at (213)452-4184 or 4187, prior to the date for receipt of bids. In addition, no more than 2 visitors per firm will be permitted within the building. No exceptions will be made. The offeror is responsible for compliance with the security requirements and shall ensure that any company representative, courier or delivery personnel are aware of these special procedures pertaining to hand carried bids.

NOTICE OF VISITOR(S)

1. Date(s) of Visit (<i>Inclusive</i>)		2. Arrival Time	
3. Name of Visitor(s) (<i>Last, First</i>)		4. Agency/Company of Visitor	
5. Name of Person Being Visited (<i>Include Div, Br, Sec</i>)	6. Suite Number	7. Telephone Number	
8. Contact Person (<i>if other than Person Being Visited</i>)		9. Telephone Number	
10. Other Comments or Instructions			
<ul style="list-style-type: none"> - All visitors must report to the Public Affairs Office, Suite 980 - Visitors must use the Visitor Tag provided. - Visitors must be escorted to Corps of Engineers floors - Parking validation is only available for Engineering Division, Construction-Operations, and Information Management field personnel. - Delivery personnel will be validated for 30 minutes only. 			

52.214-5000 ARITHMETIC DISCREPANCIES EFARS 52.214-5000

(a) For the purpose of initial evaluation of bids, the following will be utilized in resolving arithmetic discrepancies found on the face

of the bidding schedule as submitted by bidders:

- (1) Obviously misplaced decimal points will be corrected;
- (2) Discrepancy between unit price and extended price, the unit price will govern;
- (3) Apparent errors in extension of unit prices will be corrected;
- (4) Apparent errors in addition of lump sum and extended prices will be corrected.

(b) For the purpose of bid evaluation, the Government will proceed on the assumption that the bidder intends his bid to be evaluated on the basis of the unit prices, the totals arrived at by resolution of arithmetic discrepancies as provided above and the bid will be so reflected on the abstract of bids.

(c) These correction procedures shall not be used to resolve any ambiguity concerning which bid is low.

(End of statement)

52.0214-4583 TELEGRAPHIC BIDS/OFFERS ARE NOT ACCEPTABLE

Any telegram to modify or withdraw a bid/offer sent to this office must be physically delivered to the office designated for receipt of bid/offer by the date and time set for bid opening/receipt of proposals.

No one from this office will be dispatched to the local telegraph office to pick up any telegram for any reason.

52.0214-4584 FACSIMILE BIDS/OFFERS

Facsimile bids/offers, modifications thereto, or cancellations of bids/offers will not be accepted.

52.0214-4599 EVALUATION FOR AWARD

The Government contemplates award of one contract to the responsive, responsible bidder who submits the low bid for the total of all the items in the Bidding Schedule.

52.216-1 TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a Firm Fixed Price contract resulting from this solicitation.

(End of clause)

52.225-12 NOTICE OF BUY AMERICAN ACT REQUIREMENT-- CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS (FEB 2000)

(a) Definitions. Construction material, designated country construction material, domestic construction material, foreign construction material, and NAFTA country construction material, as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act--Balance of Payments Program--Construction Materials under Trade Agreements" (Federal Acquisition Regulation (FAR) clause 52.225-11).

(b) Requests for determination of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act or Balance of Payments Program should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act or Balance of Payments Program before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers. (1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act or Balance of Payments Program, based on claimed unreasonable cost of domestic construction materials, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(4)(i) of FAR clause 52.225-11.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers. (1) When an offer includes foreign construction material, other than designated country or NAFTA country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic, designated country, or NAFTA country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic, designated country, or NAFTA country construction material, and the offeror shall be required to furnish such domestic, designated country, or NAFTA country construction material. An offer based on use of the foreign construction material for which an exception was requested--

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

52.228-1 BID GUARANTEE (SEP 1996)

(a) Failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

(b) The bidder shall furnish a bid guarantee in the form of a firm commitment, e.g., bid bond supported by good and sufficient surety or sureties acceptable to the Government, postal money order, certified check, cashier's check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid guarantees, other than bid bonds, (1) to unsuccessful bidders as soon as practicable after the opening of bids, and (2) to the successful bidder upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.

(c) The amount of the bid guarantee shall be 20% percent of the bid price or \$3,000,000.00, whichever is less.

(d) If the successful bidder, upon acceptance of its bid by the Government within the period specified for acceptance, fails to execute all contractual documents or furnish executed bond(s) within 10 days after receipt of the forms by the bidder, the Contracting Officer may terminate the contract for default.

(e) In the event the contract is terminated for default, the bidder is liable for any cost of acquiring the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference.

52.228-4506 INDIVIDUAL SURETIES IN SUPPORT OF BID BONDS

Bidder/offerors utilizing individual sureties in support of a bid bond shall include a Standard Form (SF) 28 (Affidavit of Individual Surety), accompanied by a pledge of acceptable assets from each person acting as an individual surety, and include these with the SF 24 (Bid Bond), and the bid itself (see clause titled "Pledges of Assets," FAR 52.228-11). Pledges of acceptable assets shall be in the form of (1) evidence of an escrow account and/or (2) a recorded lien on real estate. If this is an RFP, failure to provide required documentation described herein may cause the offeror to be deemed "unacceptable".

52.228-4507 BID GUARANTEE FORM AND AMOUNT

When bids/proposals exceed \$100,000, the offeror shall furnish a separated bid guarantee in accordance with the solicitation provision titled "Bid Guarantee", FAR 52.228-1. In accordance with FAR 28.101-2 the bid guarantee amount shall be a least 20 percent of the "bid price" but shall not exceed \$3 million. When the penal sum is expressed as a percentage, a maximum dollar limitation may be stated. If there are

option line items on the Pricing Schedule (Schedule B), the term "bid price" is hereby defined as the total bid not to include any amount for line items designated as "options". In bids/proposals that contain "additives", the "bid price" is defined as the total of all bid items including additive line items. FAR 28.106-1 states that a Standard Form (SF) 24 shall be used for the bid bond. In accordance with FAR 28.202(a)(1), corporate sureties utilized must appear on the list contained in the Department of Treasury Circular 570 titled "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and Acceptable Reinsuring Companies."

52.232-38 SUBMISSION OF ELECTRONIC FUNDS TRANSFER INFORMATION WITH OFFER (MAY 1999)

The offeror shall provide, with its offer, the following information that is required to make payment by electronic funds transfer (EFT) under any contract that results from this solicitation. This submission satisfies the requirement to provide EFT information under paragraphs (b)(1) and (j) of the clause at 52.232-34, Payment by Electronic Funds Transfer--Other than Central Contractor Registration.

- (1) The solicitation number (or other procurement identification number).
- (2) The offeror's name and remittance address, as stated in the offer.
- (3) The signature (manual or electronic, as appropriate), title, and telephone number of the offeror's official authorized to provide this information.
- (4) The name, address, and 9-digit Routing Transit Number of the offeror's financial agent.
- (5) The offeror's account number and the type of account (checking, savings, or lockbox).
- (6) If applicable, the Fedwire Transfer System telegraphic abbreviation of the offeror's financial agent.
- (7) If applicable, the offeror shall also provide the name, address, telegraphic abbreviation, and 9-digit Routing Transit Number of the correspondent financial institution receiving the wire transfer payment if the offeror's financial agent is not directly on-line to the Fedwire and, therefore, not the receiver of the wire transfer payment.

(End of provision)

52.233-2 SERVICE OF PROTEST (AUG 1996)

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from Lucia A. Carvajal, P. O. Box 532711, Los Angeles, CA 90053-2325

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

(End of provision)

52.236-27 SITE VISIT (CONSTRUCTION) (FEB 1995)

(a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigations and Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, offerors or quoters are urged and expected to inspect the site where the work will be performed.

(b) Site visits may be arranged during normal duty hours by contacting Julie Martinez at 562. 861.1094. An organized site visit will be held on November 7, 2002 at 10:00 AM. Please meet at the following location:

2493 Pomona-Rincon Rd
Corona, CA
(which is at the entrance gate of the facility)

52.211-5000 EVALUATION OF SUBDIVIDED ITEMS (MAR 1995)—EFARS

Item Nos. 0057, 0058, 0059, 0063, 0068, and 0069 are subdivided into two or more estimated quantities and are to be separately priced. The Government will evaluate each of these items on the basis of total price of its sub-items.

(End of clause)

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SECTION 03305

CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 117/117R	(1990; Errata) Standard Tolerances for Concrete Construction and Materials
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 214	(1977; R 1989) Recommended Practice for Evaluation of Strength Test Results of Concrete
ACI 305R	(1991) Hot Weather Concreting
ACI 318/318R	(1995) Building Code Requirements for Structural Concrete and Commentary
ACI 503.2	(1992; R 1997) Standard Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy System

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A137.1	(1988) Ceramic Tile
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31	(1998) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1997) Concrete Aggregates
ASTM C 39	(1996) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 40	(1992) Organic Impurities in Fine Aggregates for Concrete
ASTM C 42	(1994) Obtaining and Testing Drilled Cores and Sawed Beam of Concrete

ASTM C 94	(1998c) Ready-Mixed Concrete
ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 127	(1988; R 1993) Specific Gravity and Absorption of Course Aggregate
ASTM C 128	(1993) Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 142	(1978; R 1990) Clay Lumps and Friable Particles in Aggregates
ASTM C 143	(1997) Slump of Hydraulic Cement Concrete
ASTM C 150	(1997) Portland Cement
ASTM C 171	(1992) Sheet Materials for Curing Concrete
ASTM C 172	(1997) Sampling Freshly Mixed Concrete
ASTM C 192	(1995) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1997e1) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 309	(1995) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	(1998) Chemical Admixtures for Concrete
ASTM C 535	(1989) Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 566	(1989) Total Moisture Content of Aggregate by Drying
ASTM C 597	(1983; R 1991) Pulse Velocity Through Concrete
ASTM C 618	(1997) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C 803	(1990) Penetration Resistance of Hardened Concrete

ASTM C 805	(1994) Rebound Number of Hardened Concrete
ASTM C 881	(1990) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 928	(1992a) Packaged Dry, Rigid-Hardening Cementitious Materials for Concrete Repairs
ASTM C 937	(1980; R 1991) Grout Fluidifier for Preplaced-Aggregate Concrete
ASTM C 989	(1997) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM C 1059	(1991) Latex Agents for Bonding Fresh to Hardened Concrete
ASTM C 1064	(1986; R 1993) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	(1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1107	(1991a) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 4791	(1995) Flat or Elongated Particles in Coarse Aggregate

CORPS OF ENGINEERS (COE)

COE EM 1110-2-2000	Engineering and Design - Standard Practice for Concrete
COE ER 1110-1-2002	(1998) Cement, Slag, and Pozzolan Acceptance Testing
COE CRD-C 55	(1995) Within-Batch Uniformity of Freshly Mixed Concrete
COE CRD-C 94	(1995) Specifications for Surface Retarders
COE CRD-C 100	(1975) Method of Sampling Concrete Aggregate and Aggregate Sources, and Selection of Material for Testing
COE CRD-C 104	(1980) Method of Calculation of the Fineness Modulus of Aggregate
COE CRD-C 143	(1962) Specifications for Meters for Automatic Indication of Moisture in Fine Aggregate
COE CRD-C 318	(1979) Cloth, Burlap, Jute (or Kenaf)

COE CRD-C 400 (1963) Requirements for Water for Use in
Mixing or Curing Concrete

COE CRD-C 521 (1981) Standard Test Method for Frequency
and Amplitude of Vibrators for Concrete

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44 (1994) NIST Handbook 44: Specifications,
Tolerances, and other Technical
Requirements for Weighing and Measuring
Devices

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100 (1990) Concrete Plant Standards

1.2 GOVERNMENT TESTING AND STUDIES

1.2.1 Preconstruction Testing and Mixture-Proportioning Studies

1.2.1.1 Aggregates

The aggregate sources listed in paragraph: MATERIAL SPECIFICATION, have been tested, and at the time testing was performed, these sources were capable of producing materials of the quality and quantity required for this project provided suitable processing is performed. Samples from any source selected consisting of not less than 100 pounds of each size of coarse aggregate and 250 pounds of fine aggregate, taken under the supervision of the Contracting Officer in accordance with COE CRD-C 100, shall be delivered to the US Army Corps of Engineers, Engineering Research and Development Center (ERDC), 3909 Halls Ferry Road, Vicksburg MS, 39180-6199, ATTN:Toy Poole, CEERD-GM-C; within 15 days after notice to proceed. Sampling and shipment of samples shall be at the Contractor's expense. 60 days will be required to complete evaluation of the aggregates. Testing will be performed by the Government in accordance with the applicable COE CRD-C or ASTM test methods. Tests to which aggregate may be subjected are listed in paragraph: MATERIAL SPECIFICATION. The material from the proposed source shall meet the quality requirements of this paragraph to be used for the project. The Government test data and other information on aggregate quality of those sources listed in paragraph: MATERIAL SPECIFICATION, and are available for review in the District Office. Quality assurance testing of aggregates by the Government does not relieve the Contractor of quality control requirements.

1.2.1.2 Cementitious Materials, Admixtures, and Curing Materials

Notify the Contracting Officer of the source, brand name, type, and quantity of all materials (other than aggregates) to be used in the manufacture and curing of the concrete at least 60 days in advance of submitting samples for mixture proportioning studies. The Contractor shall assist the Contracting Officer in obtaining samples of each material. Sampling and testing as determined appropriate will be performed by and at the expense of the Government. If cement or pozzolan are to be obtained from more than one source, the notification shall state the estimated amount of cement or pozzolan to be obtained from each source and the proposed schedule of shipments. When pozzolan other than fly ash is used, it shall be from one source.

1.2.1.3 Materials for Mixture-Proportioning Studies

At least 135 days in advance of the time when placing of concrete is expected to begin, samples of representative materials proposed for this project and meeting all the requirements of this specification shall be delivered to US Army Corps of Engineers, Engineering Research and Development Center (ERDC), 3909 Halls Ferry Road, Vicksburg MS, 39180-6199, ATTN:Toy Poole, CEERD-GM-C, by the Contractor at his expense. Samples of aggregates shall be taken under the supervision of the Contracting Officer in accordance with COE CRD-C 100, accompanied by test reports indicating conformance with grading and quality requirements hereinafter specified. Samples of materials other than aggregates shall be representative of those proposed for the project and shall be submitted accompanied by manufacturer's test reports indicating compliance with applicable specified requirements. Quantities of materials required shall be as follows:

MATERIAL	QUANTITY
1-1/2 inch nominal maximum-size coarse aggregate	7,000 pounds
3/4 inch nominal maximum-size coarse aggregate	8,000 pounds
Fine aggregate	11,000 pounds
Cement	4,000 pounds
Pozzolans	1,500 pounds
Ground Granulated Blast Furnace Slag	4,000 pounds
Chemical Admixtures (each)	5 gallons

Mixture-proportioning studies will be made by the Government at its expense.

1.2.2 Construction Testing by the Government

1.2.2.1 General

The Government will sample and test cementitious materials, admixtures, aggregates, and concrete during construction as considered appropriate to determine compliance with the specifications. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with COE CRD-C 100. Slump will be determined in accordance with ASTM C 143, except the point of sampling will be as directed. Compression test specimens will be made and laboratory cured in accordance with ASTM C 31 and will be tested in accordance with ASTM C 39.

1.2.2.2 Testing Aggregates

Testing performed by the Government will not relieve the Contractor of his responsibility for testing as appropriate for quality control. During construction, aggregates will be sampled for acceptance testing as delivered to the mixer to determine compliance with specification provisions. The Contractor shall provide necessary facilities and labor for the ready procurement of representative samples under Contracting Officer supervision. The Government will test such samples at its expense using appropriate COE CRD-C and ASTM methods.

1.2.2.3 Cementitious Materials

Cementitious materials shall be sampled at the mill, shipping point, or site of the work by the Contracting Officer. If tests prove that a material which has been delivered is unsatisfactory, it shall be promptly removed from the site of the work. Cementitious materials that have not been used within 6 months after being tested will be retested by the Government at the expense of the Contractor when directed.

1.2.2.4 Cement

Cement shall be tested for conformance with ASTM C 150 and the requirements specified herein. The cement will also be evaluated under the guidelines used to establish a qualified cement source as outlined in COE ER 1110-1-2002; Appendix A, Cement Quality Management System. The cement producer will be required to submit samples for physical and chemical testing, as well as historic quality control data. Cement will be sampled and tested by or under the supervision of the Contracting Officer and at the Government's expense. No cement shall be used until notice has been given by the Contracting Officer that test results for chemical and physical requirements as well as all evaluation requirements are satisfactory. In the event of failure, the cement may be resampled and tested at the request of the Contractor and at the Contractor's expense. Cement will be subject to check testing from samples obtained at the source, at transfer points, or at the project site, as scheduled by the Contracting Officer, and such sampling will be by or under the supervision of the Government at its expense. A copy of the mill tests from the cement manufacturer shall be furnished to the Contracting Officer for each lot delivered to the site of the work. The cost of testing cement excess to project requirements or of retesting as a result of failure of tests or change of sources will also be at the Contractor's expense and will be deducted from payments due the Contractor at a rate of \$3,200.00 per test. Material not meeting specifications shall be promptly removed from the site of work.

1.2.2.5 Pozzolan

The pozzolan shall be tested for conformance with ASTM C 618 and the requirements specified herein. The pozzolan will also be evaluated under the guidelines used to establish a qualified pozzolan source as outlined in COE ER 1110-1-2002; Appendix B, Pozzolan Quality Management System. The pozzolan producer will be required to submit samples for physical and chemical testing, as well as historic quality control data. Pozzolan will be sampled and tested by or under the supervision of the Contracting Officer and at the Government's expense. No pozzolan shall be used until notice has been given by the Contracting Officer that test results for chemical and physical requirements as well as all evaluation requirements are satisfactory. In the event of failure, the pozzolan may be resampled and tested at the request of the Contractor and at the Contractor's expense. Pozzolan will be subject to check testing from samples obtained at the source, at transfer points, or at the project site, as scheduled by the Contracting Officer, and such sampling will be by or under the supervision of the Government at its expense. A copy of the mill tests from the pozzolan manufacturer shall be furnished to the Contracting Officer for each lot delivered to the site of the work. The cost of testing pozzolan excess to project requirements or of retesting as a result of failure of tests or change of sources will also be at the Contractor's expense and will be deducted from payments due the Contractor at a rate of \$3,200.00 per test. Material not meeting specifications shall be promptly

removed from the site of work.

1.2.2.6 (Deleted)

1.2.2.7 (Deleted)

1.2.2.8 Ground Granulated Blast-Furnace Slag

Ground Granulated Blast Furnace Slag (GGBFS) shall be tested for conformance with ASTM C 989 and the requirements specified herein. The GGBFS will also be evaluated under the guidelines used to establish a qualified GGBFS source as outlined in COE ER 1110-1-2002; Appendix A, Cement Quality Management System. The GGBFS producer will be required to submit samples for physical and chemical testing, as well as historic quality control data. GGBFS will be sampled and tested by or under the supervision of the Contracting Officer and at the Government's expense. No GGBFS shall be used until notice has been given by the Contracting Officer that test results for chemical and physical requirements as well as all evaluation requirements are satisfactory. In the event of failure, the GGBFS may be resampled and tested at the request of the Contractor and at the Contractor's expense. GGBFS will be subject to check testing from samples obtained at the source, at transfer points, or at the project site, as scheduled by the Contracting Officer, and such sampling will be by or under the supervision of the Government at its expense. A copy of the mill tests from the GGBFS manufacturer shall be furnished to the Contracting Officer for each lot delivered to the site of the work. The cost of testing GGBFS excess to project requirements or of retesting as a result of failure of tests or change of sources will also be at the Contractor's expense and will be deducted from payments due the Contractor at a rate of \$3,200.00 per test. Material not meeting specifications shall be promptly removed from the site of work.

1.2.2.9 Chemical Admixtures

The Contractor shall provide satisfactory facilities for ready procurement of adequate test samples. All sampling and testing of a chemical admixture will be by and at the expense of the Government. Tests will be conducted using samples of materials proposed for the project.

1.2.2.10 Concrete Strength

Compressive strength test specimens will be made by the Government and cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39.

The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'_c and no individual test result falls below the specified strength f'_c by more than 500 psi. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including nondestructive testing, taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.

- a. Investigation of Low-Strength Test Results - When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 500 psi or if tests of field-cured cylinders indicate deficiencies in protection and

curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. Nondestructive testing in accordance with ASTM C 597, ASTM C 803, or ASTM C 805 may be permitted by the Contracting Officer to estimate the relative strengths at various locations in the structure as an aid in evaluating concrete strength in place or for selecting areas to be cored. Such tests shall not be used as a basis for acceptance or rejection.

- b. Testing of Cores - When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Contracting Officer to least impair the performance of the structure. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement.
- c. Load Tests - If the core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318/318R. Concrete work evaluated by structural analysis or by results of a load test shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies will be performed and approved by the Contracting Officer at the expense of the Contractor, except that if all concrete is in compliance with the plans and specifications, the cost of investigations, testing, and load tests will be at the expense of the Government.

1.3 DESIGN REQUIREMENTS

The following requirements are for mixture proportions prepared by the contractor.

1.3.1 Concrete Strength

Minimum specified compressive strength f'_c shall be as follows:

COMPRESSIVE STRENGTH (PSI)	STRUCTURE OR PORTION OF STRUCTURE
4,000 @ 28 days*	Intake structure, transition structure, outlet conduit, stilling basin, and parabolic drop structure
4,000 @ 28 days	Bridge elements, precast elements, generator and gaging station building foundation, and structural elements not described below
3,250 @ 28 days	Bridge footings and bridge retaining walls
3,000 @ 28 days	Runout channel, outlet channel, and concrete not described elsewhere

COMPRESSIVE STRENGTH (PSI)	STRUCTURE OR PORTION OF STRUCTURE
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2,500 @ 28 days	Temporary concrete
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2,000 @ 28 days	Lean mix concrete
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* Concrete used in parts of these structures will be proportioned by the Contracting Officer.

1.3.2 Maximum Water-Cement (W/C) Ratio

Maximum W/C shall be as follows:

WATER-CEMENT RATIO, BY MASS	STRUCTURE OR PORTION OF STRUCTURE
0.45	Intake structure, transition structure, outlet conduit, stilling basin, and parabolic drop structure
0.50	Permanent concrete construction exposed to soils or water not described elsewhere
0.50	Bridge deck slabs, prestressed and precast members, and generator and gaging station building foundation
0.55	Other portions of bridge structures
0.65	Temporary concrete, lean mix concrete and concrete not described elsewhere

These W/C's may cause higher strengths than that required by paragraph: CONCRETE STRENGTH.

1.4 CONSTRUCTION TOLERANCES

1.4.1 General

Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing. When forms or shoring are used, the measurements shall be made prior to removal. Tolerances are not cumulative. The most restrictive tolerance controls. Tolerances shall not extend the structure beyond legal boundaries. Except as specified otherwise, plus tolerance increases the amount or dimension to which it applies, or raises a level alignment and minus tolerance decreases the amount or dimension to which it applied, or lowers a level alignment. A tolerance without sign means plus or minus. Where only one signed tolerance is specified, there is no limit in the other direction. The unformed finished surfaces subject to high-velocity flow (40 fps) shall be finished to meet the tolerances for A-HV surfaces specified in Table, "TOLERANCES FOR FINISHED FORMED CONCRETE SURFACES".

The definitions of the terms used in the following tabulations are used as defined and used in ACI 117/117R. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing.

TABLE I. CONSTRUCTION TOLERANCES FOR INTAKE STRUCTURE

(a)	Variation of the constructed linear outline from the established position in the plan	20 feet..... 1/2 inch Maximum..... 1 inch
(b)	Variation in dimensions to individual structure features from established positions	In 80 feet or more.... 1 inch In buried construction And bulkhead faces.... 2 inches
(c)	Variation from the plumb, from the specified batter, or from the curved surfaces of all structures, including the lines and surfaces of columns, walls, piers, buttresses, arch sections, vertical joint grooves, and visible arises	In any 10 feet.2 inch In any 20 feet.3/4 inch Maximum..... .. 1-1/4 inches In buried Twice construction the above amounts
(d)	Variation from the level or from the grades indicated on the drawings in slabs, beams, soffits, horizontal joint grooves, and visible arises	In any 10 feet..... 5/16 inch In any 30 feet or more. 1/2 inch In buried construction. Twice the above amounts
(e)	Variation in cross-sectional dimensions of columns, beams, wet well walls, and similar members	Minus..... 1/4 inch Plus..... 1/2 inch
(f)	Variation in the thickness of slabs, walls, arch sections, and similar members	Minus..... 1/4 inch Plus..... 1/2 inch
(g)	Variation in the sizes and locations of sleeves, floor openings, and wall openings 1/4 inch
(h)	For watertight joints such as guides and sill areas, variations from the plumb and level	Not greater than 1/8 inch In 10 feet

TABLE II. TOLERANCES FOR OTHER THAN INTAKE STRUCTURE

(a)	Variation of the constructed linear outline from the established position in the plan	20 feet..... 1/2 inch Maximum..... . 1 inch
(b)	Variation in dimensions to individual structure features from established positions	Maximum..... 1/2 inch In flow areas..... 1/4 inch
(c)	Variation from the plumb, from the specified batter, or from the curved surfaces	In any 10 feet..... 1/2 inch Maximum..... 1 inch
(d)	Variation from the level or from the grades indicated on the	In any 10 feet.....5/16 inch In any 30 feet or more. 1/2 inch

TABLE II. TOLERANCES FOR OTHER THAN INTAKE STRUCTURE

drawings in slabs, beams, water conveying conduits, soffits, horizontal joint grooves, and visible arises		
(e)	Variation in cross-sectional dimensions of columns, beams, walls, and similar members	Minus..... 1/4 inch Plus..... 1/2 inch
(f)	Variation in the sizes and locations of sleeves and openings in floors, roofs, and walls 1/4 inch

TABLE III. TOLERANCES FOR BRIDGES

(a)	Departure from established alignment 1 inch
(b)	Departure from established grades 1 inch
(c)	Variation in cross-sectional dimensions of columns, piers, slabs, walls, beams, and similar parts	Minus..... 1/4 inch Plus..... 1/2 inch
(d)	Variation in thickness of bridge slabs	Minus..... 1/8 inch Plus..... 1/4 inch
(e)	Footings	
	i. Variation of dimensions in plan	Minus..... 1/2 inch Plus..... 2 inches When formed or plus 3 inches when placed against unformed excavation
	ii. Misplacement of eccentricity	2 percent of the footing width in the direction of misplacement but not more than.....2 inches
	iii. Reduction in thickness	Minus..... .5 percent

1.4.2 Surface Requirements

1.4.2.1 General

The surface requirements for the classes of finish required by paragraph shall be as hereinafter specified. Allowable irregularities are designated "abrupt" or "gradual" for purposes of providing for surface variations. Offsets resulting from displaced, misplaced, or mismatched forms shall be considered "abrupt" irregularities. Irregularities resulting from warping, unplaneness, or similar uniform variations from planeness, or true curvature, shall be considered "gradual" irregularities. "Gradual" irregularities will be checked for compliance with the prescribed limits

with a 5-foot template, consisting of a straight edge for plane surfaces and a shaped template for curved or warped surfaces. In measuring irregularities, the straightedge or template may be placed anywhere on the surface in any direction, with the testing edge held parallel to the intended surface.

Class of Finish	Maximum Irregularities	
	Abrupt, Inches	Gradual, Inches
HV	*	1/8
PV	1/8	1/4
Other	1/4	1/2
Backfill	1	1

* Variation for Class HV finish shall not exceed zero positive and 1/8-inch negative in the direction of flow of the water.

1.4.2.2 Grinding

Grinding of concrete to meet HV surface requirements is acceptable up to a maximum of 10 exposed aggregate particles with any dimension exceeding 1/4-inch in any 1-square-foot area. The required grinding bevel is as follows:

Station	Bevel (Minimum)
9+10 to 21+02.50	1 to 20

Grinding of surfaces is acceptable up to a maximum of 1/2 inch of removed concrete.

1.4.2.3 Prevention of Repeated Failure to Meet Tolerances

When a concrete placement results in concrete (prior to grinding or patching) that does not meet specified tolerances or surface requirements, an outline of all preventative actions such as modifications to forming, placing, or finishing, to be implemented by the Contractor to avoid repeated failures shall be submitted upon request. The Government reserves the right to delay concrete placements until such approved preventive actions have been implemented.

1.4.3 Appearance

Permanently exposed surfaces shall be cleaned, if stained or otherwise discolored, by a method that does not harm the concrete and that is approved by the Contracting Officer.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Plant Layout, G.

Drawings showing the layout of the plant proposed for use at least 30 days prior to beginning of the plant installation. The drawings shall show the location of the principal components of the construction plant; offices; shop and storage facilities; and storage areas and yards which the Contractor proposes to construct within the project limits. Drawings shall also be furnished showing the general features of the aggregate processing plant; aggregate transporting, storage and reclaiming facilities; coarse aggregate rescreening plant; concrete batching and mixing plant; concrete conveying and placing plant; and worker's hoists. The drawings shall appropriately show the capacity of each major feature of the plant; rated capacity of the aggregate transporting storage and reclaiming facilities; volume of aggregate stored; capacity of cement storage; rated capacity of the concrete batching and mixing plant; rated capacity of the worker's hoists. The size of the mixers and bins and the structural components of the plant shall also be shown. The layout of other construction facilities shall be provided in sufficient detail to demonstrate adequacy of the facility. The plant layout shall show the proposed location of the laboratory and adjacent parking lot with access roads. Drawings showing any changes in plant made during design and erection or after the plant is in operation shall also be submitted. Final drawings will be submitted in a computerized graphics form satisfactory to the Contracting Officer.

Lift Drawings, G.

A lift drawing and bill of materials shall be furnished for each lift of concrete. (Only one lift shall be shown on a drawing). These drawings shall be to scale and shall show all embedded items in sufficient detail for the proper installation and prosecution of the work. All embedded electrical and/or mechanical items shall be identified. The drawings shall not be less than 22 by 34 inches in size and the scale used shall be sufficiently large to clearly show all details of the structure covered by these drawings. A note shall be included on each lift drawing indicating all contract drawings from which the lift drawing was prepared. The contractor shall submit 6 copies of each drawing for review at least 60 days prior to scheduling the lift for placement. Final drawings will be submitted in a computerized graphics form satisfactory to the Contracting Officer.

SD-03 Product Data

Batch Plant, G.

Details and data on the concrete plant shall be submitted within 60 days prior to assembly for review by the Contracting Officer for review for conformance with the requirements of paragraph: EQUIPMENT.

Mixers

The make, type, capacity, and number of the concrete mixers proposed for use shall be submitted 60 days prior to installation for review by the Contracting Officer for conformance with the requirements of paragraph: EQUIPMENT.

Contractor Supplied Mixture Proportions, G.

Concrete mixture proportions for concrete mixtures as indicated hereinafter to be prepared by the Contractor. The concrete mixture quantities of all ingredients per cubic yard and nominal maximum coarse aggregate size that will be used in the manufacture of each quality of concrete shall be stated. Proportions shall indicate the mass of cement, pozzolan or slag when used and water; the mass of aggregates in a saturated surface-dry condition; and the quantities of admixtures. The submission shall be accompanied by test reports from a laboratory complying with ASTM C 1077 which show that proportions thus selected will produce concrete of the qualities indicated. No substitution shall be made in the source or type of materials used in the work without additional tests to show that the quality of the new materials and concrete are satisfactory.

Construction Methods; G.

The method, personnel, and equipment proposed for concrete placement of all concrete monoliths 60 days before placement begins. A separate submittal is required for each area, (such as foundation, tower and gates, downstream conduits, and outlet channel. A complete chronological procedure including forms, bulkheads, reinforcement, waterstops, concrete placement, vibration, finishing, joint cleanup, curing, protection, repair of defects, and Contractor quality control shall be included. The plan for placement of concrete in massive elements shall include information as shown in COE EM 1110-2-2000, Chapter 2, Figure 2. The Government reserves the right to delay concrete placements that do not have or are not in accordance with a construction methods as approved by the Contractor Officer.

SD-05 Design Data

Testing Technicians; G.
Concrete Construction Inspector; G.

The Contractor shall submit statements that the concrete testing technicians and the concrete inspectors meet the requirements of paragraph: TESTS AND INSPECTION.

Equipment for Conveying

The methods and description of the equipment proposed for transporting, handling, and depositing the concrete shall be submitted for review 60 days before concrete placement begins. The data submitted shall include site drawings or sketches with locations of equipment and placement site.

Construction Joint Treatment; G.

The method and equipment proposed for joint cleanup and waste disposal shall be submitted for approval for conformance with paragraph: CONSTRUCTION JOINT TREATMENT.

Curing and Protection; G.

The curing media and methods to be used shall be submitted for approval for conformance with paragraph: CURING AND PROTECTION.

Cold Weather Placing; G.

When concrete is to be placed under cold-weather conditions, a description of the materials and methods proposed for protection of the concrete meeting the requirements of paragraph: COLD WEATHER PROTECTION shall be submitted for approval.

Hot-Weather Placing; G.

When concrete is to be placed under hot-weather conditions, a description of the materials and methods proposed for protection of the concrete meeting the requirements of paragraph: HOT-WEATHER PLACING and FINISHING shall be furnished 60 days in advance of anticipated need date for approval.

Special Temperature-Controlled Concrete

When special temperature controls as specified by paragraph: SPECIAL TEMPERATURE-CONTROLLED CONCRETE are required, all methods and equipment shall be submitted for review and comment 60 days in advance of anticipated date required for use.

SD-07 Certificates

Sheet Curing

If sheet curing is used, a manufacturer's certificate shall be furnished certifying that the materials complies with the requirements of ASTM C 171.

Nonshrink Grout; G.

Descriptive literature of the grout proposed for use containing certified laboratory test results showing that it meets ASTM C 1107 shall be submitted 60 days prior to its use together with a certificate from the manufacturer stating that the grout is suitable for the application or exposure for which it is being considered. In addition, a detailed plan shall be submitted for review, showing equipment and procedures for use in mixing and placing the grout.

Bonding Agents

Descriptive literature and certification shall be submitted in advance of their use showing that the following materials meet the specified standards:

Latex Bonding Agent	ASTM C 1059
Epoxy Resin	ASTM C 881 Type V

Expansive Admixture

Manufacturer's descriptive literature for fluidifier to be used as expansive admixture in block-out concrete with certificate stating that the material meets the requirements of ASTM C 937 shall be submitted 60 days prior to its use.

Color Admixture; G

When color-conditioned concrete is specified, color admixture shall be introduced in the concrete. Color sample shall be available with the Contracting Officer, and the color additive shall be submitted for review and approval 60 days prior its use.

Floor and Wall Tiles; G

Sample of tiles and grout shall be submitted to the Contracting Officer for approval and color selection.

Admixtures; G

Descriptive literature and manufacturer's certificate that the admixture conforms to the requirements of ASTM C 260 or ASTM C 494 as specified hereinafter.

1.6 MATERIAL DELIVERY, STORAGE, AND HANDLING

1.6.1 Cementitious Materials

1.6.1.1 Transportation

When bulk cement, pozzolan, or ground granulated blast-furnace slag is not unloaded from primary carriers directly into weather-tight hoppers at the batching plant, transportation from the railhead, mill, or intermediate storage to the batching plant shall be accomplished in adequately designed weather-tight trucks, conveyors, or other means that will protect the material from exposure to moisture.

1.6.1.2 Storage

Cementitious materials shall be furnished in bulk except that cement used for finishing and patching may be packaged. Immediately upon receipt at the site of the work, all cementitious materials, shall be stored in separate dry, weather-tight, and properly ventilated structures. All storage facilities shall permit easy access for inspection and identification. Sufficient materials shall be in storage to complete any lift of concrete started. In order that cement may not become unduly aged after delivery, the Contractor shall use any cement that has been stored at the site for 60 days or more before using cement of lesser age.

1.6.1.2 Separation of Materials

Separate facilities shall be provided for unloading, transporting, and handling each cementitious material. Separate appropriate storage facilities shall be provided for each type of cement and each source of pozzolan, or slag. The contents of each storage facility shall be plainly marked with a large permanent sign posted near the loading port.

1.6.2 Aggregate Storage

Fine aggregate and each size of coarse aggregate shall be stored in separate size groups adjacent to the batch plant and in such a manner as to prevent the intermingling of size groups or the inclusion of foreign materials in the concrete. Sufficient fine and coarse aggregate shall be maintained at the site at all times to permit continuous placement and completion of any lift of concrete started.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

2.1.1.1 Portland Cement

Portland cement shall conform to ASTM C 150, Type II or V, low-alkali. The Contractor shall submit written certification for the heat of hydration limit as stated herein above for each order of cement delivered to the job at least one day prior to the cement delivered on the job site.

Cement in mixtures for the special temperature control concrete, placed in accordance with the Low Heat Mixtures as described in paragraph Special Temperature-Controlled Concrete shall have the heat of hydration of 70 calories per gram at 7 days.

Cement in mixtures for the special temperature control concrete, placed in accordance with the High Heat Mixtures as described in paragraph Special Temperature-Controlled Concrete need not have the heat of hydration limited to 70 calories per gram at 7 days.

2.1.1.2 Pozzolan

Pozzolan shall conform to ASTM C 618, Class F, with the loss on ignition limited to 6 percent.

2.1.1.3 Ground Granulated Blast-Furnace Slag

Ground granulated blast-furnace slag shall conform to ASTM C 989, Grade 120.

2.1.1.4 Portland Cement for use with the Ground Granulated Blast-Furnace Slag Concrete Mixtures

For those mixtures prepared by the Government, the contractor may be allowed to use an ASTM C 150 Type II, low alkali cement, without the heat of hydration limited to 70 calories per gram at 7 days.

2.1.1.5 Temperature of Cementitious Materials

The temperature of the cementitious materials as delivered to the site shall not exceed 150 degrees F.

2.1.2 Admixtures

All chemical admixtures furnished as liquids shall be in a solution of suitable viscosity for field use as determined by the Contracting Officer.

2.1.2.1 Accelerating Admixture

Calcium chloride shall not be used. Accelerators shall meet the requirements of ASTM C 494, Type C.

2.1.2.2 Retarding Admixture

A retarding admixture shall meet the requirements of ASTM C 494, Type B, or D, except that the 6-month and 1-year compressive strength tests are

waived. The admixture may be added to the concrete mixture only when approved.

2.1.2.3 Water-Reducing Admixture

Water-reducing admixtures shall conform to ASTM C 494, Type A.

2.1.2.4 Expansive Admixture

Expansive admixture used in block-out concrete shall conform to ASTM C 937.

2.1.2.5 Color Admixture

Color admixture for color-conditioned concrete shall match the color sample available from the Contracting Officer.

2.1.2.6 Air-Entraining Admixture

Air Entraining admixture shall conform to ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions.

2.1.3 Curing Materials

2.1.3.1 Sheet Materials

Sheet curing materials shall conform to ASTM C 171, type optional, except polyethylene sheet shall not be used.

2.1.3.2 Membrane-Forming Curing Compound

Membrane-forming curing compound shall conform to ASTM C 309, Type 2, except a styrene acrylate or chlorinated rubber compound meeting ASTM C 309, Class B, requirements may be used for surfaces that are to be painted or are to receive subsequent coatings, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, coating, or flooring specified.

2.1.3.3 Burlap

Burlap for curing purposes shall conform to COE CRD-C 318.

2.1.4 Water

Water for washing aggregates and for mixing and curing concrete shall be free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances and shall comply with COE CRD-C 400.

2.1.5 Aggregates

2.1.5.1 Aggregate Composition

Fine aggregate shall consist of natural sand, manufactured sand, or a combination of natural and manufactured sands. Coarse aggregate shall consist of gravel, crushed gravel, crushed stone, or a combination thereof.

2.1.5.2 Quality

Aggregates delivered to the mixer shall be obtained from the specified

sources and shall conform to the requirements of ASTM C 33.

2.1.5.3 Grading

- a. Fine Aggregate - The grading of the fine aggregate as delivered to the mixers shall be such that the individual percent retained on any sieve shall not vary more than 3 percent from the percent retained on that sieve in a fixed grading selected by the Contractor with the approval of the Contracting Officer. The fixed grading may be selected at the start of concrete placement and based upon 30 days fine aggregate production or selected after the first 30 days of concrete placement. The minimum individual percent retained on the No. 8 sieve shall be 5 percent and on all smaller sieves shall be 10 percent. In addition to the grading limits, the fine aggregate, as delivered to the mixer, shall have a fineness modulus of not less than 2.25 nor more than 2.85. The grading of the fine aggregate shall also be controlled so that the fineness moduli groups (average of the current test and the previous two tests) of the fine aggregate as delivered to the mixer shall not vary more than 0.10 from the target fineness modulus of the fixed grading selected by the Contractor and approved by the Contracting Officer. The range of each group shall not exceed 0.20. The fineness modulus shall be determined in accordance with COE CRD-C 104. At the option of the Contractor, fine aggregate may be separated into two or more sizes or classifications, but the uniformity of grading of the separate sizes shall be controlled so that they may be combined throughout the job in fixed proportions established during the first 30 days of concrete placement. The selected fixed grading shall be within the following limits, except any individual test result may be outside these limits if within the allowable 3 percent variation from the selected grading.

U.S. STANDARD SIEVE DESIGNATION

PERMISSIBLE LIMITS PERCENT BY WEIGHT, PASSING

3/8-in.	100
No. 4	95 - 100
No. 8	80 - 95
No. 16	60 - 80
No. 30	35 - 60
No. 50	15 - 30
No. 100	5 - 10
No. 200	0 - 5

- b. Coarse Aggregate - The coarse aggregate shall be rescreened just prior to delivery to the concrete batch plant bins. The grading of the coarse aggregate within the separate size groups shall conform to the following requirements as delivered to the mixer.

PERCENT BY WEIGHT PASSING INDIVIDUAL SIEVES

U.S. STANDARD SIEVE DESIGNATION	No.4 to 3/4 inch	3/4 inch to 1-1/2 inch
2 inch	-	100
1-1/2 inch	-	90 - 100
1 inch	100	20 - 45

PERCENT BY WEIGHT PASSING
INDIVIDUAL SIEVES

U.S. STANDARD SIEVE DESIGNATION	No.4 to 3/4 inch	3/4 inch to 1-1/2 inch
3/4 inch	90 - 100	0 - 10
3/8 inch	20 - 55	0 - 5
No. 4	0 - 10	
No. 8	0 - 5	

2.1.5.4 Particle Shape

The quantity of flat and elongated particles in the separate size groups of coarse aggregate, as determined by ASTM D 4791, using a value of 3 for width-thickness ratio and length-width ratio shall not exceed 25 percent in any size group.

2.1.5.5 Moisture Content

The fine aggregate shall not be placed in bins at the batch plant until it is in a stable state of moisture content. A stable moisture content shall be reached when the variation in the percent of total moisture tested in accordance with ASTM C 566 and when sampled at the same location will not be more than 0.5 percent during 1 hour of the 2 hours prior to placing the material in the batch plant bins and the variation in moisture content when sampled at the same location shall not be more than 2.0 percent during the last 8 hour period that the aggregate remains in the stockpile. The coarse aggregate shall be delivered to the mixers with the least amount of free moisture and the least variation in free moisture practicable under the job conditions. Under no conditions shall the coarse aggregate be delivered to the mixer "dripping wet".

2.1.5.6 Commercial Concrete Aggregate Sources

Concrete aggregates may be furnished from any source capable of meeting the quality requirements stated in paragraph: AGGREGATES. The following sources were evaluated during the design phase of the project in 1995 and were found at that time capable of meeting the quality requirements when suitably processed. No guarantee is given or implied that any of the following listed sources are currently capable of producing aggregates that meet the required quality stated in paragraph: AGGREGATES. Test results and conclusions shall be considered valid only for the sample tested and shall not be taken as an indication of the quality of all material from a source nor for the amount of processing required.

a. List of Sources:

Robertsons Redimix, Gypsum Canyon
Sunwest Materials, Lytle Creek
Inland Rock Co., Day Creek

b. Selection of Source - After the award of the contract, the Contractor shall designate in writing only one source or combination of sources from which he proposes to furnish aggregates. Regardless of the source selected, samples for quality-assurance testing shall be provided as required by paragraph: PRECONSTRUCTION TESTING AND MIXTURE-PROPORTIONING STUDIES. If a source for coarse or fine aggregate so designated

by the Contractor does not meet the quality requirements stated in the paragraph: AGGREGATE, the Contractor may not submit for approval other sources but shall furnish the coarse or fine aggregate, as the case may be, from one or a combination of the sources listed at no additional cost to the Government.

2.1.1.6 Nonshrink Grout

Nonshrink grout for use in setting base plates and machinery shall conform to ASTM C 1107, and shall be a commercial formulation suitable for the application proposed. The Grade of grout shall be as indicated by the manufacturer, for the particular application selected.

2.1.1.7 Packaged Dry Repair Materials

Packaged dry rapid-hardening cementitious materials for concrete repairs shall be a commercial formulation conforming to ASTM C 928 requiring only the addition of water.

2.1.1.8 Bonding Agents

Bonding agents shall meet the following requirements.

2.1.1.8.1 Latex Bonding Agent

Latex agents for bonding fresh to hardened concrete shall conform to ASTM C 1059, Type II.

2.1.1.8.2 Epoxy Resin

Epoxy resins for use in repairs, epoxy grout, and grouting dowels shall conform to ASTM C 881, Type V, Grade I or II.

2.1.1.9 Surface Retarder

Surface retarder shall conform to COE CRD-C 94.

2.1.1.10 Floor and Wall Tiles

Tiles for floor and walls in the toilet room shall be 1" x 1" x 3/8" and shall be standard grade glazed tiles conforming to ANSI A137.1. Specially shaped tiles shall be provided as required at corners, edges, etc.

2.2 MIXTURE PROPORTIONING

2.2.1 Composition

Concrete shall be composed of cementitious materials, water, fine and coarse aggregates, and admixtures. The cementitious materials shall be portland cement, portland cement in combination with pozzolan, or portland cement in combination with ground granulated blast-furnace slag. The admixtures shall be an Air Entraining Admixture, an WRA or an accelerating admixture. A retarding admixture may be used at the request of the Contractor when approved. No other chemical admixtures than those listed above shall be used. For each portion of the structure, mixture proportions shall be selected so that the strength and W/C requirements listed in paragraph: DESIGN REQUIREMENTS are met.

2.2.2 Proportioning Responsibility

The concrete mixtures in the intake structure, below elevation 500 and the stilling basin invert will be proportioned by the Contracting Officer. All other mixtures will be proportioned by the Contractor. Preliminary mixture-proportioning studies or thermal studies which include mixture proportions are available for review in the District Office. Some mixtures, especially those containing higher amounts of pozzolans, may have slow strength gain which may impact form design and form removal time.

2.2.3 Government-Designed Mixtures

Based on preliminary mix design studies the Government-designed mixtures for use in the mass concrete construction will contain the following approximate amounts of cementitious materials. Final mix designs will be determined using the proposed job materials in accordance with paragraph: Materials for Mixture Proportioning Studies.

2.2.3.1 Mixtures Using Type V and/or Type II Cement in Combination with Fly Ash

Mixtures containing Type V and/or Type II cement shall contain approximately **425** lbs of cement and **215** lbs of fly ash per cubic yard.

2.2.3.2 Mixtures Using Type II Cement in Combination with Granulated Ground Blast Furnace Slag (GGBFS) Cement

Mixtures containing Type II cement in combination with GGBFS shall contain approximately **160** lbs of Type II cement and **360** lbs of GGBFS cement per cubic yard.

2.2.4 Control

The proportions of all material entering into each concrete mixture will be furnished to the Contractor. The proportions will be changed by the Contracting Officer as necessary. Adjustments shall be made by the Contractor to the batch weights of aggregates and water as necessary to compensate for free moisture in the aggregates.

2.2.5 Nominal Maximum-Size of Aggregate

The nominal maximum-size of coarse aggregate to be used in the various parts of the work shall be in accordance with the following tabulation except as directed. The NMSA may be changed for sections requiring a special quality of concrete as directed.

FEATURES	NOMINAL MAXIMUM-SIZE AGGREGATE
Sections 7-1/2 in. or less in width or slabs 4 in. or less in thickness or any section with a clear distance between reinforcement less than 2-1/4 in.	3/4 in.
Sections over 7-1/2 in. or slabs at least 4 in. in thickness. However, this size shall not be used in any section in which the clear distance between reinforcement is less than 2-1/4 in.	1-1/2 in.

2.2.6 Slump

The slump shall be determined in accordance with ASTM C 143 and shall be 2 inches + 1 inch for massive features and between 1 and 4 inches for all others except where placement by pump is approved, in which case the slump shall be 4-1/2 + 1-1/2 inches. In addition, the range of each set of two consecutive tests for each mixture shall be not more than 2 inches. The above specified slump is that required at the forms.

2.2.7 Air Content

The air content by volume shall be determined in accordance with ASTM C 143.

When the nominal maximum size of coarse aggregate is 1-1/2 inches or larger, the total air content of the sample measured in accordance with ASTM C 231 shall be between 4 and 7 percent. When the nominal maximum-size coarse aggregate is 3/4 inch, the air content shall be between 5 and 7 percent. The specified air content is that required at the forms.

2.2.8 Contractor Concrete Proportioning

Trial batches and testing requirements for various qualities of concrete specified shall be the responsibility of the Contractor. Samples of aggregates shall be obtained in accordance with the requirements of ASTM D 75. Samples of materials other than aggregate shall be representative of those proposed for the project and shall be accompanied by the manufacturer's test reports indicating compliance with applicable specified requirements. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios, which will produce a range of strength encompassing those required for the work. The maximum water-cement ratios required in paragraph: MAXIMUM WATER-CEMENT RATIO will be converted to a weight ratio of water to cement plus pozzolan by mass, or GGBF slag by mass equivalency as described in ACI 211.1. In the case where GGBF slag is used, the weight of the slag shall be included in the equations for the term P, which is used to denote the mass of pozzolan. If pozzolan is used in the concrete mixture, the minimum pozzolan content shall be 15 percent of the total cementitious material. Trial mixtures shall be proportioned for maximum permitted slump and air content with due consideration to the approved conveying and placement method. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192. They shall be tested at 7 days and at the design age specified in paragraph: DESIGN REQUIREMENTS in accordance with ASTM C 39. From these test results, a curve will be plotted showing the relationship between water-cement ratio and strength.

2.2.9 Required Average Compressive Strength

In meeting the strength requirements specified in paragraph: CONCRETE STRENGTH, the selected mixture proportion shall produce a required average compressive strength f'_{cr} exceeding the specified strength f'_c by the amount indicated below.

2.2.9.1 Average Compressive Strength from Test Records

Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those

expected, shall represent concrete produced to meet a specified strength or strengths (f'_c) within 1,000 psi of that specified for proposed work, and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days or at another test age designated for determination of f'_c . Required average compressive strength f'_{cr} used as the basis for selection of concrete proportions shall be the larger of the equations that follow using the standard deviation as determined above:

$$f'_{cr} = f'_c + 1.34S$$

$$f'_{cr} = f'_c + 2.33S - 500$$

Where S = standard deviation

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

NUMBER OF TESTS*	MODIFICATION FACTOR FOR STANDARD DEVIATION
less than 15	-**
15	1.16
20	1.08
25	1.03
30 or more	1.00

* Interpolate for intermediate numbers of tests.

** Use tabulation in paragraph: DETERMINING REQUIRED AVERAGE STRENGTH

2.2.9.2 Average Compressive Strength without Previous Test Records

When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength f_{cr} shall be determined as follows: If the specified compressive strength f'_c is less than 3,000 psi,

$$f'_{cr} = f'_c + 1,000$$

If the specified compressive strength f'_c is 3,000 to 5,000 psi,

$$f'_{cr} = f'_c + 1,200$$

If the specified compressive strength f'_c is over 5,000 psi,

$$f'_{cr} = f'_c + 1,400$$

2.2.10 Color-Conditioned Concrete

The dosage rate of the color admixture used shall be as specified by the manufacturer. The proportions of the other admixtures used shall be adjusted as required to provide a workable concrete mix. A vertical sample panel of adequate size shall be made for approval using the contemplated materials and construction techniques.

PART 3 EXECUTION

3.1 EQUIPMENT

3.1.1 Capacity

The batching, mixing, conveying, and placing systems shall have a capacity of at least 100 cubic yards per hour.

3.1.2 Batch Plant

Batch plant shall meet the following requirements.

3.1.2.1 Location

The concrete production plant shall be located at the site of the work in a specific location selected by the Contractor.

3.1.2.2 Bins and Silos

Separate bins, compartments, or silos shall be provided for each size or classification of aggregate and for each of the cementitious materials. The compartments shall be of ample size and so constructed that the various materials will be maintained separately under all working conditions. All compartments containing bulk cement, pozzolan, or ground granulated blast-furnace slag shall be separated from each other by a free-draining air space. All filling ports shall be clearly marked with a permanent sign stating the contents.

3.1.2.3 Batching Equipment

- a. Batchers - Aggregate shall be weighed in separate weigh batchers with individual scales. Bulk cement and/or other cementitious materials shall each be weighed on a separate scale in a separate weigh batcher. Water shall be measured by weight or by volume. If measured by weight, it shall not be weighed cumulatively with another ingredient. Ice shall be measured separately by weight. Admixtures shall be batched separately and shall be batched by weight or by volume in accordance with the manufacturer's recommendations.
- b. Water Batchers - A suitable water-measuring and batching device shall be provided that will be capable of measuring and batching the mixing water within the specified tolerances for each batch. The mechanism for delivering water to the mixers shall be free from leakage when the valves are closed. The filling and discharge valves for the water batcher shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. When a water meter is used, a suitable strainer shall be provided ahead of the metering device.
- c. Admixture Dispensers - A separate batcher or dispenser shall be provided for each admixture. Each plant shall be equipped with the necessary calibration devices that will permit convenient checking of the accuracy of the dispensed volume of the particular admixture. The batching or dispensing devices shall be capable of repetitively controlling the batching of the admixtures to the accuracy specified. Piping for liquid admixtures shall be free from leaks and properly valved to prevent backflow or siphoning. The dispensing system shall include a device or devices that will detect and indicate the presence or absence of the admixture or provide a convenient means of visually observing the admixture in

the process of being batched or discharged. Each system shall be capable of ready adjustment to permit varying the quantity of admixture to be batched. Each dispenser shall be interlocked with the batching and discharge operations so that each admixture is added separately to the batch in solution in a separate portion of the mixing water or in fine aggregate in a manner to ensure uniform distribution of the admixtures throughout the batch during the required mixing period. Storage and handling of admixtures shall be in accordance with the manufacturers recommendations.

- d. Moisture Control - The plant shall be capable of ready adjustment to compensate for the varying moisture content of the aggregates and to change the weights of the materials being batched. A moisture meter complying with the provisions of COE CRD-C 143 shall be provided for measurement of moisture in the fine aggregate. The sensing element shall be arranged so that the measurement is made near the batcher charging gate of the fine aggregate bin or in the fine aggregate batcher.
- e. Scales - Adequate facilities shall be provided for the accurate measurement and control of each of the materials entering each batch of concrete. The weighing equipment and controls shall conform to the applicable requirements of NIST HB 44, except that the accuracy shall be within 0.2 percent of the scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring device. Tests shall be made at the frequency required in paragraph: TESTS AND INSPECTIONS, and in the presence of a Government quality assurance representative. Each weighing unit shall include a visible indicator that shall indicate the scale load at all stages of the weighing operation and shall show the scale in balance at zero load. The weighing equipment shall be arranged so that the concrete plant operator can conveniently observe the indicators.
- f. Operation and Accuracy - The weighing operation of each material shall start automatically when actuated by one or more starter switches and shall end when the designated amount of each material has been reached. These requirements can be met by providing a semiautomatic or automatic batching system as defined by NRMCA CPMB 100. There shall be equipment to permit the selection of 5 preset mixes each by the movement of not more than two switches or other control devices. Cumulative weighing will not be permitted. The weigh batchers shall be so constructed and arranged that the sequence and timing of batcher discharge gates can be controlled to produce a ribboning and mixing of the aggregates, water, admixtures, and cementitious materials as the materials pass through the charging hopper into the mixer. The plant shall include provisions to facilitate the inspection of all operations at all times. Delivery of materials from the batching equipment shall be within the following limits of accuracy:

MATERIAL	PERCENT
Cementitious materials	+ 1
Water	+ 1
Aggregate smaller than	

- | MATERIAL | PERCENT |
|--|---------|
| 1-1/2 in. size | + 2 |
| Aggregate larger than
1-1/2 in. size..... | + 3 |
| Chemical admixtures | + 3 |
- g. Interlocks - Batchers and mixers shall be interlocked so that:
- (1) The charging device of each batcher cannot be actuated until all scales have returned to zero balance within + 0.2 percent of the scale capacity and each volumetric device has reset to start or has signaled empty.
 - (2) The charging device of each batcher cannot be actuated if the discharge device is open.
 - (3) The discharge device of each batcher cannot be actuated if the charging device is open.
 - (4) The discharge device of each batcher cannot be actuated until the indicated material is within the allowable tolerances.
 - (5) One admixture is batched automatically with the water.
 - (6) Each additional admixture is batched automatically with a separate portion of the water or with the fine aggregate.
 - (7) The mixers cannot be discharged until the required mixing time has elapsed.
- h. Recorder - An accurate recorder or recorders shall be provided and shall conform to the following detailed requirements:
- (1) The recorder shall produce a graphical or digital record on a single visible chart or tape of the weight or volume of each material in the batchers at the conclusion of the batching cycle. The record shall be produced prior to delivery of the materials to the mixer. After the batchers have been discharged, the recorder shall show the return to empty condition.
 - (2) A graphical recording or digital printout unit shall be completely housed in a single cabinet that shall be capable of being locked.
 - (3) The chart or tape shall be so marked that each batch may be permanently identified and so that variations in batch weights of each type of batch can be readily observed. The chart or tape shall be easily interpreted in increments not exceeding 0.5 percent of each batch weight.
 - (4) The chart or tape shall show time of day at intervals of not more than 15 minutes.
 - (5) The recorder chart or tape shall become the property of the Government.

- (6) The recorder shall be placed in a position convenient for observation by the concrete plant operator and the Government inspector.
- (7) The recorded weights or volumes when compared to the weights or volumes actually batched shall be accurate within **± 2 percent**.
- i. Batch Counters - The plant shall include devices for automatically counting the total number of batches of all concrete batched and the number of batches of each preset mixture.
- j. Rescreening Plant - A rescreening plant shall be located, arranged, and operated in a manner that all coarse aggregate will be routed through the plant and that its operation will ensure delivery to the mixers of graded coarse aggregate free from excessive variation and conforming to the size groups and grading of paragraph: AGGREGATES and with moisture content conforming to the provisions of paragraph: MOISTURE CONTENT. Coarse aggregate may be rescreened and delivered to the batch plant bins one size group at a time or two or more adjacent size groups at a time. Simultaneous rescreening of nonadjacent size groups is not permitted. All material passing the bottom screen of the smallest size of coarse aggregate being screened shall be wasted.
- k. Washing Plant - All coarse aggregates shall be washed immediately prior to entering the rescreening plant. The rewashing plant shall contain adequate water nozzles and vibrating screens to remove foreign materials and coatings from aggregate particles. Water used for washing shall meet the requirements of paragraph: WATER.
- l. Trial Operation - Not less than 7 days prior to commencement of concrete placing, a test of the batching and mixing plant shall be made in the presence of the Contracting Officer to check operational adequacy. The number of full-scale concrete batches required to be produced in trial runs shall be as directed, will not exceed 20, and shall be proportioned as directed. All concrete produced in these tests shall be wasted or used for purposes other than inclusion in structures covered by this specification. All deficiencies found in plant operation shall be corrected prior to the start of concrete placing operations. No separate payment will be made to the Contractor for labor or materials required by provisions of this paragraph. The Contractor shall notify the Contracting Officer of the trial operation not less than 7 days prior to the start of the trial operation.
- m. Protection - The weighing, indicating, recording, and control equipment shall be protected against exposure to dust, moisture, and vibration so that there is no interference with proper operation of the equipment.

3.1.2.4 Laboratory Areas

A room shall be provided in the plant to house the moisture and grading testing equipment for aggregate and to provide working space. Another room shall be provided for testing fresh concrete and for fabricating and initial curing of concrete test specimens in accordance with ASTM C 31.

The size, arrangement, and location of these rooms will be subject to approval. The Contractor shall provide electricity, air conditioning, heat, and water as required for use in these laboratory areas. Section 01500 Quality Assurance of these specifications presents requirements for a separate building equipped for a testing laboratory.

3.1.2.5 Plant Layout Drawings

Drawings, in triplicate, showing the layout of the plant the Contractor proposes to use on the work shall be submitted by the Contractor for review. The drawings shall show the locations of the principal components of the construction plant; offices; shop and storage building; housing facilities, if any; and storage areas and yards which the Contractor proposes to construct at the site of the work and elsewhere. The Contractor shall also furnish for review drawings, in triplicate, showing the general features of his aggregate processing plant; aggregate transporting; storage and reclaiming facilities; aggregate rinsing and dewatering plant, if required; coarse aggregate rescreening plant, if required; concrete batching and mixing plant; concrete conveying and placing plant; and when precooling of concrete is required, the cooling plant. The drawing shall appropriately show the capacity of each major feature of the plant including the rated capacity of the aggregate production plant in tons per hour of fine and coarse aggregates; rated capacity of the aggregate transporting, storage and reclaiming facilities; volume of aggregate storage; capacity of cement and pozzolan storage; rated capacity of the concrete batching and mixing plant in cubic yards per hour; rated capacity of the concrete transporting and placing plant in cubic yards per hour; and when used rated capacity of plant for precooling of concrete. Drawings in triplicate showing any changes in plant made during design and erection or after the plant is in operation shall be submitted for review. Two sets of the drawings will be retained and one set will be returned to the Contractor with comments. Final drawings incorporating final comments and any changes made during operation of the plants will be supplied to the Government on drawings in an electronic media format acceptable to the Contracting Officer.

3.1.3 Mixers

Mixers shall be stationary mixers. Each mixer shall combine the materials into a uniform mixture and discharge this mixture without segregation. Mixers shall not be charged in excess of the capacity recommended by the manufacturer on the nameplate. Excessive over-mixing requiring introduction of additional water will not be permitted. The mixers shall be maintained in satisfactory operating condition, and mixer drums shall be kept free of hardened concrete. Mixer blades or paddles shall be replaced when worn down more than 10 percent of their depth when compared with the manufacturer's dimension for new blades. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired or replaced. The size of the batch, the mixing time, the charging sequence, and other factors identified by the contractor shall be adjusted to provide concrete that meets the uniformity limits specified herein. All testing shall be performed in accordance with COE CRD-C 55. When regular testing is performed, the concrete shall meet the limits of any five of the six uniformity requirements. When abbreviated testing is performed, the concrete shall meet only those requirements listed for abbreviated testing. The initial mixer evaluation test shall be a regular test and shall be performed prior to the start of concrete placement. The concrete proportions used for the evaluation shall contain the largest size aggregate on the project and shall be as directed. Regular testing shall

consist of performing all six tests on three batches of concrete. The range for regular testing shall be the average of the ranges of the three batches. Abbreviated testing shall consist of performing the three required tests on a single batch of concrete. The range for abbreviated testing shall be the range for one batch. If more than one mixer is used and all are identical in terms of make, type, capacity, condition, speed of rotation, etc., the results of tests on one of the mixers shall apply to the others, subject to approval. Mixer evaluations shall be performed by the Contractor in accordance with paragraph: MIXER UNIFORMITY. However, the initial evaluation will be performed by the Government. The Contractor shall provide labor and equipment as directed to assist the Government in performing any evaluation made by the Government.

PARAMETER	REGULAR TESTS ALLOWABLE MAXIMUM RANGE FOR AVERAGE OF 3 BATCHES	ABBREVIATED TESTS ALLOWABLE MAXIMUM RANGE FOR 1 BATCH
Unit weight of air-free mortar, lb/cu ft	2.0	2.0
Air content, percent	1.0	---
Slump, inches	1.0	---
Coarse aggregate, percent	6.0	6.0
Compressive strength at 7 days, percent	10.0	10.0
Water content, percent	1.5	---

3.1.4 Sampling Facilities

3.1.4.1 Concrete

The Contractor shall provide suitable facilities and labor for obtaining representative samples of concrete in accordance with ASTM C 172 for Contractor quality control (QC) and Government quality assurance (QA) testing.

3.1.4.2 Coarse Aggregate

Suitable facilities shall be provided for readily obtaining representative samples of coarse aggregate for test purposes immediately prior to the material entering the mixer.

3.1.5 Transporting Equipment

Transporting equipment shall be designed, operated, and maintained so that it does not cause or permit segregation or loss of material. The concrete shall not be dropped vertically more than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized.

3.1.5.1 Buckets

Bottom-dump buckets shall conform to the following requirements: the

interior hopper slope shall be not less than 70 degrees from the horizontal; the minimum dimension of the clear gate opening shall be at least five times the nominal maximum size of the aggregate, and the area of the gate opening shall not be less than 2 square feet; the bucket gates shall be grout-tight when closed, shall be of the double clamshell type, and shall be manually, pneumatically, or hydraulically operated; and the gate-opening mechanism shall be designed to close the gates automatically when the control is released or when the air or hydraulic line is broken. If gate actuation is dependent on integral air or hydraulic reservoirs, the capacity of the reservoirs shall be sufficient to open and close the gates three times without recharging the reservoir.

3.1.5.2 Trucks

Truck mixers or agitators used for transporting central-mixed concrete shall conform to the applicable requirements of ASTM C 94. Truck mixers shall not be used to transport concrete with larger than 1-1/2 inch nominal maximum-size aggregate or 2 inch or lower slump. Nonagitator trucks may be used for transporting central-mixed concrete over a smooth road when the hauling time is less than 15 minutes and the slump is less than 3 inches. Bodies of nonagitator trucks shall be smooth, watertight, metal containers specifically designed to transport concrete, shaped with rounded corners to minimize segregation, and equipped with gates that will permit positive control of the discharge of the concrete.

3.1.5.3 Chutes

When concrete can be placed directly from a truck mixer, agitator, or nonagitator truck, the chutes supplied by the truck manufacturer as standard equipment may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment shall not be permitted for conveying concrete except when specifically approved and in no case shall slump be increased to accommodate their use.

3.1.5.4 Belt Conveyors

Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer or delivery truck to final place of deposit without segregation of ingredients or loss of mortar and shall be provided with positive means for preventing segregation of the concrete or loss of mortar at the transfer point(s) and the point of placing. The idler spacing shall not exceed 36 inches. Belt speed shall be a minimum of 300 feet per minute and a maximum of 750 feet per minute. Belt width shall be a minimum of 16 inches if the NMSA is 3 inches or less. The NMSA required in mixture proportions furnished by the Government will not be changed to accommodate the belt width.

3.1.5.5 Pump Placement

Concrete may be conveyed by positive-displacement pump when approved. Pump placement will be approved only for areas where placement by bucket or conveyor is difficult or impractical. The pumping equipment shall be piston or squeeze-pressure type. The pipeline shall be rigid-steel pipe or heavy-duty flexible hose. Aluminum pipe shall not be used. The inside diameter of the pipe shall be at least 3 times the nominal maximum size of the coarse aggregate in the concrete to be pumped but not less than 4 inches.

3.2 PREPARATION FOR PLACING

3.2.1 Vibrators

An adequate number of vibrators shall be on hand to meet placing requirements, and spare vibrators shall be available to maintain production in the event of breakdown. There shall be adequate air pressure available for air vibrators and adequate voltage for electric vibrators. Vibrators of the proper size, frequency, and amplitude shall be used for the type of work being performed in conformance with the following requirements:

APPLICATION	HEAD DIAMETER INCHES	FREQUENCY VPM	AMPLITUDE INCHES
Thin walls, beams, etc.	1-1/4 - 2-1/2	9,000 - 13,500	0.020 - 0.04
General construction	2 - 3-1/2	8,000 - 12,000	0.025 - 0.05
Heavy sections	3 - 6	7,000 - 10,500	0.030 - 0.06
Mass concrete	5 - 7	5,500 - 8,500	0.040 - 0.08

The frequency and amplitude shall be within the range indicated in the tabulation as determined in accordance with paragraph: TESTS AND INSPECTIONS.

3.2.2 Embedded Items

Before placing concrete, care shall be taken to determine that all embedded items are securely fastened in place as indicated in the drawings or required. Embedded items shall be free of oil and other foreign matter such as loose coatings of rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Any air or water lines or other materials embedded in structures as authorized construction expedients shall conform to the above requirements and upon completion of their use shall be backfilled with concrete or mortar as directed. Welding will not be permitted on embedded or otherwise exposed metals which are in contact with concrete surfaces. Tack welding of or to embedded items will not be permitted.

3.2.3 Concrete on Earth Foundations

Earth foundations upon which concrete is to be placed shall be clean, damp, and free from frost, ice, and standing or running water. Prior to placement of concrete, the earth foundation shall have been satisfactorily compacted in accordance with the provisions of Sections 02212 Embankment or 02250 Fills and Subgrade Preparation, as applicable.

3.2.4 Concrete on Rock Foundations

Rock surfaces upon which concrete is to be placed shall be clean and free from oil, standing or running water, ice, mud, drummy rock, coatings, debris, and loose, semidetached, overhanging, or unsound fragments. Faults or joints shall be cleaned to a satisfactory depth and to firm rock on the sides as directed by the Contracting Officer. Immediately before concrete is placed, all rock surfaces shall be cleaned thoroughly by the use of air-water jet, high-pressure water jet, or sandblasting as described in paragraph: CONSTRUCTION JOINT TREATMENT. All rock surfaces shall be kept continuously wet for at least 24 hours immediately prior to placing concrete thereon. All approximately horizontal surfaces shall be covered immediately before the concrete is placed with a 1/2 inch layer of mortar

composed of the same sand and cementitious materials used in the concrete. The sand-cementitious materials ratio and the water-cementitious material ratio of the mortar shall be approximately the same as those used in the concrete mixture. The mortar shall be covered with concrete before the mortar has reached its initial time of setting.

3.2.5 Construction Joint Treatment

3.2.5.1 Joint Preparation

Concrete surfaces to which other concrete is to be bonded shall be prepared for receiving the next lift or adjacent concrete by cleaning by sandblasting, high-pressure water jet, or air-water cutting. Surface cutting by air-water jets will not be permitted for concrete surfaces congested with reinforcing steel or if they are relatively inaccessible. If, for any other reason, it is considered undesirable to disturb the surface of a lift before it has hardened, the use of sandblasting or high-pressure water jet after hardening will be required. Regardless of the method used, the resulting surface shall be free from all laitance and inferior concrete so that clean, well-bonded coarse aggregate particles are exposed uniformly over the lift surface. Application of the joint treatment method shall be such that the edges of the larger particles of aggregate are not undercut. Where joint preparation occurs more than 2 days prior to placing the next lift or where the work in the area subsequent to the joint preparation causes dirt or debris to be deposited on the surface, the surface shall be cleaned as the last operation prior to placing the next lift. The surface of the construction joint shall be kept continuously wet for the first 12 hours of the 24 hours prior to placing concrete, except that the surface shall be damp with no free water at the time of placement.

3.2.5.2 Air-Water Cutting

Air-water cutting of a construction joint shall be performed at the proper time, generally between 4 and 12 hours after placement and only on horizontal construction joints. This period may be modified if a retarder is used to prolong the setting of the cement at surface of the concrete. The air pressure used in the jet shall be 90 to 110 psi, and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure. When approved a surface retarder complying with the requirements of COE CRD-C 94 may be applied to the surface of the lift to prolong the period of time during which air-water cutting is effective. Prior to receiving approval, the Contractor shall furnish samples of the material to be used and shall demonstrate the method to be used in its application. After cutting, the surface shall be washed and rinsed until the wash water is no longer cloudy. If air-water cutting does not produce acceptable results, the surface shall be prepared by high-pressure water jet or sandblasting.

3.2.5.3 High-Pressure Water Jet

A stream of water under a pressure of not less than 3,000 psi may be used for cleaning. Its use shall be delayed until the concrete is sufficiently hard so that only the surface skin or mortar is removed and there is no undercutting of coarse-aggregate particles. If the high-pressure water jet is incapable of a satisfactory cleaning, the surface shall be cleaned by sandblasting.

3.2.5.4 Wet Sandblasting

This method of joint preparation may be used when the concrete has reached sufficient strength to prevent undercutting of coarse aggregate particles. The operation shall be continued until all accumulated laitance, coatings, stains, debris, and foreign materials are removed. The surface of the concrete shall then be washed thoroughly to remove all loose material. This method may be used on both horizontal and vertical surfaces.

3.2.5.5 Waste Water Disposal

The method used in disposing of waste water employed in cutting, washing, and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures, or damage the environment of the project area. The method of disposal shall meet all requirements of Section 01430 Environmental Protection.

3.2.6 Form Checkout Card System

A standardized form checkout card system will be used for maintaining the recorded control of the performance of concrete work under this contract. Prior to placing any lift of concrete in any structure, all items of work in the lift including but not limited to foundations, drainage, forms, reinforcing steel, mechanical, electrical, cleanup, and safety requirements will be checked by the Government for compliance with plans, specifications, approved construction methods and approved lift drawings. A final clearance signature on the checkout card must be obtained from the Contracting Officer before commencing placement of concrete in each placement. This checkout method will not relieve any responsibility for ascertaining that all preparatory work and all clearance does not relieve the Contractor of the responsibility for any errors, omissions, or work not meeting the requirements of the plans and specifications. All screeds shall be checked and rechecked as the placement is topped out.

3.3 TRANSPORTING AND PLACING

3.3.1 Transporting

Methods and equipment for conveying and depositing the concrete into the form shall be subject to approval. The capacity of the transporting system shall be sufficient to supply concrete at a rate to prevent cold joints forming during placement. A properly designed and sized elephant trunk and rigid drop chute bottom section which will prevent free-fall within the elephant trunk and rigid drop chute will be used if concrete is to drop more than 5 feet. If concrete is to be placed through installed horizontal or sloping reinforcing bars, the concrete shall discharge into a pipe or elephant trunk that is long enough to extend through the reinforcing bars to within 5 feet of the placing surface. In no case will concrete be discharged to free fall through the reinforcing bars.

3.3.1.1 Transporting by Bucket

There shall be provided indicating and signaling devices for the control of identification of types or classes of concrete as they are mixed and discharged into buckets for transfer to the forms. Each type or class of concrete shall be visually identified by placing a colored tag or marker on a bucket as it leaves the mixing plant so that the concrete may be positively identified in the forms and placed in the structure in the desired position.

3.3.1.2 Transporting by Pump

The nominal maximum-size coarse aggregate will not be reduced or mixture proportions changed to accommodate a pump except as specifically determined appropriate. The distance and height to be pumped shall not exceed limits recommended by the pump manufacturer. The concrete shall be supplied to the pump continuously. When pumping is completed, concrete remaining in the pipeline shall be ejected without contamination of concrete in place. After each operation the equipment shall be thoroughly cleaned and flushing water shall be wasted outside the forms.

3.3.1.3 Transporting by Belt Conveyor

Methods and equipment for transporting the concrete by belt conveyor into the form shall be subject to approval.

3.3.2 Placing

The capacity of the placing system shall be sufficient to supply concrete at a rate which will prevent cold joints in any placement. Concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items without permitting the material to segregate. Concrete shall be deposited as close as possible to its final position in the forms, and in so depositing, there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively placed and consolidated in horizontal layers not exceeding 5 feet in thickness with a minimum of lateral movement. The amount of concrete deposited shall be such that it can be readily and thoroughly consolidated and shall not exceed 4 cubic yards in one pile. All concrete-placing equipment and methods shall be subject to approval. Concrete placement will not be permitted when, in the opinion of the Contracting Officer, weather conditions prevent proper placement and consolidation.

Drop chutes, elephant trunks, and/or tremies should be used in walls and columns to prevent free-fall of the concrete and to allow the concrete to be placed through reinforcing steel. They should be moved at short intervals to prevent stacking of concrete. Vibrators should be used to move the mass of concrete through the forms.

3.3.2.1 Time Interval Between Mixing and Placing

Concrete mixed in stationary mixers and transported by nonagitating equipment shall be placed within 30 minutes after it has been mixed, unless otherwise authorized. When concrete is truck mixed or when a truck mixer or agitator is used for transporting concrete mixed by stationary mixers, the concrete shall be delivered to the site of the work, and discharge shall be completed within 1-1/2 hours after introduction of the cement to either the water or aggregate.

3.3.2.2 Hot-Weather Placing

The temperature of the concrete when deposited in the forms during hot weather shall not exceed 85 degrees F except as further required by paragraph: TRANSPORTING AND PLACING and Special Temperature Controlled Concrete. An approved retarding admixture may be used in accordance with paragraph: MATERIAL SPECIFICATION to facilitate placing and finishing. Steel forms and reinforcement and conveying and placing equipment shall be

cooled if necessary to assist in maintaining specified concrete-placing temperature. The temperature of the fresh concrete shall be measured in accordance with ASTM C 1064.

3.3.2.3 Cold Weather Placing

The temperature of the concrete when deposited in the forms shall not be less than 40 degrees F. The ambient temperature of the placement area and all surfaces to receive concrete shall be above 32 degrees F. Materials entering the mixer shall be free from ice, snow, and frozen lumps. The heating of mixing water or aggregates necessary to keep the concrete temperature above 40 degrees F shall be closely regulated so that the concrete temperature does not exceed 60 degrees F. An accelerator may be used when approved in advance.

3.3.2.4 Special Temperature-Controlled Concrete

Special temperature control is applicable to **mass concrete placements** in the elements indicated in the table **below**. **Regardless** of the requirements specified above, the concrete shall have a temperature not exceeding that specified below and not less than 40 degrees F, when measured at least 20 minutes after mixing. Heating of the mixing water or aggregates will not be permitted until the temperature of the concrete has decreased to 45 degrees F. The materials shall be heated in such a manner that they will be free from ice, snow, and frozen lumps before entering the mixer.

Structural Element	Maximum Placing Temperature (Degrees F)	
	Low Heat Mixtures	High Heat Mixtures
Intake Structure Below Elevation 470 (Sta 9+10 to Sta 10+00)	65	55
Intake Structure Above Elev 470 and Below Elevation 545 (Sta 9+10 to Sta 10+00)	70	60
Stillng Basin Invert Between Sta 18+13.40 and Sta Sta 21+02.50	65	55

The following methods may be used for cooling plastic concrete:

- (1) Precooling of aggregates by screening from direct sunlight, spraying with chilled water, and (if required) sending the aggregates through a chilling system just prior to batching.
- (2) Using chilled water for mixing or substituting up to 50 percent by weight of ice for mixing water.
- (3) Liquid nitrogen cooling of the concrete mixture by (a) injection of liquid nitrogen into the mixer after completion of batching and mixing, and (b) mixing liquid nitrogen with parts of the aggregate prior to batching and mixing.

3.3.2.5 Concrete Lifts

The depth of concrete placed in each lift will be as shown in the drawings.

All concrete shall be deposited in approximately horizontal layers about 1-1/2 feet in thickness in stepped progression at such a rate that the formation of cold joints will be prevented. Slabs shall be placed in one lift, unless 2-1/2 foot or more deep. Where 7-1/2 foot or greater lift depths are permitted, the Contractor shall furnish approved cantilever forms that are jointed or hinged approximately midheight to facilitate placement against surfaces sloping more than 10 degrees from vertical. At the beginning of the placing of a lift, the top half of a hinged or jointed form shall be retracted to such a position that it does not interfere with the operation of buckets placing concrete adjacent to the form. A minimum of five successive horizontal layers in stepped progression shall be used for 7-1/2 foot lifts. Where 5 foot lifts are required, a minimum of three successive horizontal layers in stepped progression shall be used. Each new layer of concrete shall be placed on the oldest exposed layer. The maximum exposed bulkhead face of concrete between adjacent monoliths shall not exceed 40 feet except as otherwise approved.

3.3.2.6 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrating equipment. Vibrators shall not be used to cause concrete to flow for significant distances within the forms. Hand spading may be used if necessary together with internal vibration along formed surfaces permanently exposed to view. Form vibrators shall not be used. The vibrator shall be inserted vertically at uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding unhardened layer if such exists. It shall be held stationary until the concrete is consolidated and then withdrawn slowly. Slabs 8 inches or less in depth shall be consolidated by approved methods.

3.4 FINISHING

3.4.1 Finish Requirements

3.4.1.1 High Velocity Finish

A high velocity (HV) finish shall be required on all concrete surfaces exposed to high velocity **flow** (40 fps) from Station 9+40 to Station 20+84.50.

3.4.1.2 Permanent View Finish

A permanent view (PV) finish shall be required for all surfaces that do not require HV finish or do not have backfill placed against them as shown.

3.4.2 Unformed Surfaces

3.4.2.1 General

The ambient temperature of spaces adjacent to surfaces being finished shall be not less than 40 degrees F. In hot weather when the rate of evaporation of surface moisture, as determined by use of Figure 2.1.5 of ACI 305R, may reasonably be expected to exceed 0.2 pounds per square foot per hour, provisions for windbreaks, shading, fog spraying, or evaporation retarding film shall be made in advance of placement to prevent plastic shrinkage

cracks, and such protective measures shall be taken before, during, and immediately after finishing as operations require. All unformed surfaces of concrete that are not to be covered by additional concrete or backfill shall have a float finish, unless a trowel finish is specified, and shall be true to elevation as shown on the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown and left true and regular. Exterior surfaces shall be sloped for drainage unless otherwise shown in the drawing or directed. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. The concrete shall be thoroughly consolidated before finishing operations commence or before leaving it for future concrete or backfill placement.

3.4.2.2 Float Finish

Surfaces to receive a float finish shall be screeded and darried or bullfloated to bring the surface to the required finish level with no coarse aggregate visible. No water, cement, or mortar shall be added to the surface during the finishing operation. Floating may be performed by use of suitable hand floats or power-driven equipment. Hand floats shall be of aluminum or magnesium. After the water sheen has disappeared, the concrete, while still green but sufficiently hardened to bear a man's weight without deep imprint, shall be floated to a true even plane.

3.4.2.3 Trowel Finish

A hard steel trowel shall be applied to all unformed surfaces requiring HV finish. Concrete surfaces shall first be given a float finish. After surface moisture has disappeared, the surface shall be troweled to a smooth, even, dense finish, free from blemishes, including trowel marks. In lieu of hand finishing, an approved power finishing machine may be used in accordance with the directions of the machine manufacturer. A final hard steel troweling shall be done by hand. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Surfaces or edges likely to be injured during the construction period shall be protected from damage.

3.4.2.4 Broom Finish

A broom finish shall be applied as indicated on the drawings. The concrete surface to be broom finished shall first be given a float finish. The surface shall then be broomed with a stiff fiber-bristle broom in a direction transverse to that of the traffic.

3.4.2.5 Bridge Decks

The Contractor shall set elevation control points, to be approved by the Contracting officer, which shall be used to establish the grade and cross section of the concrete deck surface. A tight wood float finish shall be provided on the surface of the bridge deck where excessive surface working will not be permitted. The exposed concrete surfaces shall be broomed in a transverse direction with a fine textured hair push broom to produce a uniform surface texture and eliminate float marks or shall be finished using an alternative method approved by the Contracting Officer achieving a similar surface texture. Brooming, shall be done when the surface is sufficiently set to prevent deep scarring. If directed by the Contracting Officer, a fine spray of water shall be applied to the surface immediately in advance of brooming.

3.4.3 Formed Surface Repair

3.4.3.1 General

Within 4 hours after removal of forms all ridges or lips shall be removed and undesirable local bulging on the surfaces to be permanently exposed shall be remedied. Concrete formwork requirements for the classes of finish specified are covered in SECTION: FORMWORK FOR CONCRETE. Epoxy bonding agent shall be in accordance with ACI 503.2. Latex bonding agent meeting the requirements of ASTM C 1059 may be used instead of epoxy resin if concrete to be patched was placed less than 24 hours previously.

3.4.3.2 High Velocity (HV) Finish

All defective areas (imperfections, voids, honeycomb, rock pockets, bug holes negative surface irregularities, etc...) shall be repaired as shown below:

SIZE	REMOVAL	PATCHING
1/4 to 1 inch in diameter (and holes left by removal of form tie rods)	Reamed or chipped to a roughened surface	Epoxy bonding agent dry packed mortar
1 inch diameter to 16 square inches	Reamed, chipped or cut to a minimum depth of 3 inches	Epoxy bonding agent dry packed mortar or concrete
Areas exceeding 16 square inches	Dove-tailed saw cuts to a depth of 3 inches in a rectangular pattern and chipped 1 inch past reinforcement or 6 inches total	Epoxy bonding agent concrete (saw cuts that extend past corners shall be patched with dry-packed mortar)

NOTES: Grinding to meet tolerance is acceptable only if in accordance with paragraph: Surface Requirements

Patch tolerances are smaller and are critical for HV patch and nearby concrete stability. The finished patch shall be flush at the edges and its surface shall not vary by more than 1/16 inch or it shall be removed and redone.

3.4.3.3 Permanent View (PV) Finish

The surfaces of specified exterior formed concrete permanently exposed to view shall meet the following requirements: defective areas, voids, honeycomb, and bug holes which exceed 1/2-inch in diameter and holes left by removal of form tie rods shall be reamed or chipped and filled with dry pack mortar. Defective and unsound concrete areas larger than 36 square inches and deeper than 2 inches shall be outlined by saw cuts at least 1 inch deep in an approved rectangular pattern, the defective concrete removed, and repaired with concrete replacement as specified in paragraph: Material and Procedure for Repairs. The prepared area shall be brush-coated with an approved epoxy resin or with a neat cement grout after

dampening and then filled with mortar or concrete.

3.4.3.4 All Other Formed Surfaces

After removal of forms, areas of honeycomb or voids which exceed 4 inches in diameter shall be reamed or chipped and filled with dry pack mortar. Defective and unsound areas larger than 48 square inches and deeper than 2 inches shall be removed by saw cuts in a rectangular pattern and repaired with concrete replacement as specified in paragraph: Material and Procedure for Repairs. The prepared area shall be brush-coated with an approved epoxy resin or with a neat cement grout after dampening and then filled with mortar or concrete.

3.4.3.5 Material and Procedure for Repairs

The cement used in the dry-pack mortar or replacement concrete shall be a blend of the cement utilized for production of project concrete and white portland cement properly proportioned so that the final color of the mortar or concrete will match adjacent concrete. Trial batches shall be utilized to determine the proportions required to match colors. Dry-pack mortar shall consist of 1 part cement to 2-1/2 parts fine aggregate. The fine aggregate shall be that utilized for production of project concrete. The mortar shall be remixed without addition of water until it obtains the stiffest consistency that will permit placing. Mortar shall be thoroughly compacted into the prepared void by tamping, rodding, ramming, etc., and struck off to adjacent concrete. Replacement concrete shall be produced utilizing project materials to meet requirements of the concrete it is replacing, and shall be proportioned by the Contractor and approved by the Contracting Officer. It shall be drier than the usual mixtures and shall be thoroughly compacted into the prepared void by tamping, rodding, ramming, etc., and shall be struck off and finished to adjacent concrete. Forms shall be utilized as required or as directed. Metal tools shall not be used to finish permanent view (PV) surfaces. The repaired areas shall be cured for 7 days. The temperature of the in-situ concrete, adjacent air and replacement mortar or concrete shall be above 50 degrees F during placement, finishing, and curing. Packaged materials meeting the requirements of ASTM C 928 may be used in lieu of dry-pack mortar when approved.

3.4.4 Toilet Room Finish

Tilework shall be laid out to minimize cuts less than one half the tile in size. Wall and floor tiles shall be aligned to give straight uniform grout lines. Tiles shall be set in portland cement mortar, and grout manufacturer's recommendations shall be followed as to grouting procedures and precautions.

3.5 CURING AND PROTECTION

3.5.1 Curing Time

All concrete shall be cured by one of the following methods or combination of methods for the period of time given below corresponding to the cementing materials used in the concrete:

Type III portland cement	3 days
Type II portland cement	14 days

Portland cement blended with 25 percent or

less fly-ash or GGBF slag 14 days

Portland cement blended with more than
25 percent fly-ash or GGBF slag21 days

Curing shall begin immediately after placing. The Contractor shall have all equipment needed for adequate curing and protection of the concrete on hand and ready to install before actual concrete placement begins. The curing medium and method, or the combination of media and methods used, shall be as approved in accordance with paragraph: SUBMITTALS, SD-08 Statements, submittal item "Curing".

3.5.2 Moist Curing

Horizontal and nearly horizontal surfaces shall be moist cured by ponding, by covering with a minimum uniform thickness of 2 inches of continuously saturated sand, or by covering with saturated nonstaining burlap or cotton mats. Burlap and cotton mats shall be rinsed to remove soluble substances before using. Other surfaces shall be moist cured when approved or directed. Concrete that is moist cured shall be maintained continuously, not periodically, wet for the duration of the entire curing period. Water for curing shall comply with the requirements of the paragraph: WATER. If the water, sand, mats, etc. cause staining or discoloration of permanently exposed concrete surfaces, the surfaces shall be cleaned by a method approved. When wood forms are left in place during curing, the forms shall be kept continuously wet except for sealed insulation curing in cold weather. When steel forms are left in place on vertical surfaces during curing, the forms shall be carefully broken loose from the hardened concrete and curing water continuously introduced into the void. Horizontal construction joints shall be allowed to dry sufficiently to remove free water immediately prior to placing the next lift.

3.5.3 Membrane Curing

3.5.3.1 Materials

Membrane curing may be used on surfaces that are not specified or directed to receive moist curing and that are not to receive a grout-cleaned finish. Membrane-forming curing compound shall not be used on surfaces that contain protruding steel reinforcing, that are heated by free steam, that will have additional concrete bonded to them, or that are to be grout-cleaned. Compound conforming to ASTM C 309, Type 2, Class A, may be used on surfaces that will not be exposed to view when the project is completed. Only pigmented compound of the styrene acrylate or chlorinated rubber formulation conforming to ASTM C 309, Class B, requirements may be used on surfaces that are to be painted or to receive bituminous roofing or water proofing or floors that are to receive adhesive applications of resilient flooring. The curing compound selected by the Contractor for such use shall be compatible with any subsequent paint, roofing, coating, or flooring specified elsewhere in the contract.

3.5.3.2 Application

The curing compound shall be applied to formed surfaces immediately after the forms are removed. The surfaces shall be thoroughly moistened with water, and the curing compound applied as soon as free water disappears. The curing compound shall be applied to unformed surfaces as soon as free water has disappeared provided steps have been taken when necessary to prevent premature loss of free water due to excessive evaporation as

described in paragraph: UNFORMED SURFACES. The curing compound shall be applied in a two-coat continuous operation by motorized power-spraying equipment or pressure-tank equipment operating at a minimum pressure of 75 psi with provisions for continuous agitation. The application equipment shall be approved in advance. Hand-operated pressure applicators ("garden sprayers") shall not be used except in small, isolated areas as approved. The compound shall be applied at a uniform coverage of not more than 400 square feet per gallon for each coat. The second coat shall be applied perpendicular to the first coat. Concrete surfaces that have been subjected to rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified. All concrete surfaces on which the curing compound has been applied shall be adequately protected for the duration of the entire curing period from pedestrian and vehicular traffic and from any other influence that will disrupt the continuity of the curing membrane.

3.5.4 Sheet Curing

Sheets shall be used only on horizontal or near horizontal surfaces. The sheets shall comply with the requirements of ASTM C 171, except that polyethylene sheet shall not be used. All surfaces shall be thoroughly wetted and completely covered with waterproof paper, or polyethylene-coated burlap. Covering shall be laid with light-colored side up. Covering shall be lapped not less than 4 inches and taped to form a continuous cover with completely closed joints. The sheet shall be weighted to prevent displacement so that it remains in contact with the concrete during the specified length of curing. Coverings shall be folded down over exposed edges of slabs and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

3.5.5 Curing Color-Conditioned Concrete

In order to achieve color uniformity proper curing materials as recommended by the color additive manufacturer shall be used.

3.5.6 Protection

No fire or excessive heat shall be permitted near or in direct contact with concrete at any time. No vibratory earth compaction equipment or pile-driving equipment shall be operated within 100 feet horizontally of concrete less than 5 days old. Blasting shall not be permitted within 100 feet horizontally of concrete less than 90 days old. Blasting plans shall be approved by the Contracting Officer. All galleries, conduits, and other openings through the concrete shall be kept closed or sealed during the entire construction period. The surface of the concrete shall be protected from rain or snow during placing.

3.6 BASE PLATES AND BEARING PLATES

3.6.1 Setting of Plates

After being plumbed and properly positioned, column base plates, bearing plates for beams and similar structural members, and machinery and equipment base plates shall be provided full bearing using Nonshrink grout. The space between the top of the concrete bearing surface and the bottom of the plate shall not be less than 1/24 of the width of the plate or 1/2 inch, whichever is greater. Concrete surfaces shall be clean, free of oil, grease, and laitance, and shall be damp. Metal surfaces shall be clean and free of oil, grease, and rust.

3.6.2 Nonshrink Grout

Nonshrink grout shall conform to the requirement of paragraph: MATERIAL SPECIFICATION. Water content shall be the minimum that will provide a flowable mixture and completely fill the space to be grouted without segregation, bleeding, or reduction of strength.

3.6.2.1 Mixing and Placing

Mixing and placing shall be in conformance with the material manufacturer's instructions and as specified. Ingredients shall be thoroughly dry-mixed before adding water. After adding water, the batch shall be mixed for 3 minutes. Batches shall be sized to allow continuous placement of freshly mixed grout. Grout not used within 30 minutes after mixing shall be discarded. The space between the top of the concrete or masonry bearing surface and the plate shall be filled with the grout. Forms shall be of wood or other suitable material for retaining the grout and shall be removed after the grout has hardened. If Grade "A" grout is used, all surfaces, including top surfaces, shall be formed to provide restraint. The placed grout shall be worked to eliminate voids; however, overworking and breakdown of the initial set shall be avoided. Grout shall not be retempered or subjected to vibration from any source. Where clearances are unusually small, placement shall be made under pressure with a grout pump. Temperature of the grout, and of surfaces receiving the grout, shall be maintained at 65 to 85 degrees F until after setting.

3.6.2.2 Treatment of Exposed Surfaces

Those types of grout containing metallic aggregate, Grade B or C grout, shall, after setting, have exposed surfaces under cut back 1 inch from the edge of the base plate and immediately covered with a thick coat of mortar proportioned by weight of one part portland cement, two parts sand, and sufficient water to make the mixture placeable. The parge coat shall have a smooth, dense finish. The exposed surface of other types of nonshrink grout shall have a smooth, dense finish.

3.6.2.3 Curing

Grout and parge coats shall be cured in conformance with paragraph: CURING AND PROTECTION.

3.7 BLOCK-OUT CONCRETE

3.7.1 Composition and Proportions

Block-out concrete shall be composed of portland cement, water, fine and coarse aggregate, and admixtures. The concrete mixture proportions, including admixture, will be provided by the Contracting Officer. An expansive admixture shall be used to cause the blockout concrete to expand to fit snugly in the space that confines it. The expansive admixture shall conform to the requirements of ASTM C 937 for grout fluidifier. Any block-out concrete not placed within 30 minutes after contact of the cement and admixture shall be wasted. The block-out shall be confined on all sides to provide restraint.

3.7.2 Placing Block-out Concrete

Blockouts shall be provided as shown on the plans for the embedment of gate

seal seats, gate guides, bulkhead guides, beams embedded for bulkhead seals, crane rails, and other embedded metalwork as appropriate. Prior to installation of embedded items, the block-outs or recesses shall be cleaned in accordance with applicable requirements of the paragraph on construction joint treatment. After installation of embedded items and prior to placing any forms, all surfaces of the block-outs or recesses and surfaces of items to be embedded shall be thoroughly cleaned of all loose material, oil, grease, and other contaminants which might reduce the bond between the surfaces of the blockouts or recesses and new concrete. Extreme caution shall be exercised in placing block-out concrete to avoid distortion or displacement of the embedded items.

3.8 TESTS AND INSPECTIONS

3.8.1 General

The Contractor shall perform the following inspection and tests as described, and, based upon the results of these inspections and tests, he shall take the action required and submit reports as required. When, in the opinion of the Contracting Officer, the concreting operation is out of control, concrete placement shall cease. The laboratory performing the tests shall be on-site and shall conform with the requirements given in ASTM C 1077. The individuals who sample and test concrete or the constituents of concrete as required in this specification shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and at least once per year thereafter for conformance with ASTM C 1077. The individual who performs the inspection shall have demonstrated a knowledge and ability equivalent to the ACI minimum guidelines for certification of Concrete Construction Inspector, Level II.

3.8.2 Testing and Inspection Requirements

3.8.2.1 Fine Aggregate

- a. Grading - At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 , ASTM C 117 and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. The results shall be recorded on a sheet on which are also shown the specification limits applicable to the project.
- b. Fineness Modulus Control Chart - Results for fineness modulus shall be grouped in sets of three consecutive tests, and the average and range of each group shall be plotted on a control chart. The upper and lower control limits for average shall be drawn 0.10 units above and below the target fineness modulus, and the upper control limit for range shall be 0.20 units above the target fineness modulus.
- c. Corrective Action for Fine Aggregate Grading - When the amount passing any sieve is outside the specification limits, the fine

aggregate shall be immediately resampled and retested. If there is another failure for any sieve, the fact shall immediately be reported. Whenever a point on the fineness modulus control chart, either for average or range, is beyond one of the control limits, the frequency of testing shall be doubled. If two consecutive points are beyond the control limits, the process shall be considered out of control and concreting shall be stopped. Notify the Contracting Officer, and take immediate steps to rectify the situation. After two consecutive points have fallen within the control limits, testing at the normal frequency may be resumed.

- d. Moisture Content Testing - When in the opinion of the Contracting Officer the electric moisture meter is not operating satisfactorily, there shall be at least four tests for moisture content in accordance with ASTM C 566 during each 8-hour period of mixing plant operation. The times for the tests shall be selected randomly within the 8-hour period. An additional test shall be made whenever the slump is shown to be out of control or excessive variation in workability is reported by the placing foreman. When an electric moisture meter is operating satisfactorily, at least two direct measurements of moisture content shall be made per week to check the calibration of the meter. The results of tests for moisture content shall be used to adjust the added water in the control of the batch plant.
- e. Moisture Content Corrective Action - Whenever the moisture content of the fine aggregate changes by 0.5 percent or more, the scale settings for the fine-aggregate batcher and water batcher shall be adjusted (directly or by means of a moisture compensation device).

3.8.2.2 Coarse Aggregate

- a. Grading - At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When facilities are available to test samples five times as large as those required in ASTM C 136, no averaging shall be done.
- b. Corrective Action for Grading - When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported. Where two consecutive averages of five tests (or two consecutive tests where large samples are used) are outside specification limits, the operation shall be considered out of control, and that fact shall be reported, concreting shall be stopped, and immediate steps shall be taken to correct the grading.
- c. Coarse Aggregate Moisture Content - A test for moisture content of

each size group of coarse aggregate shall be made at least once a shift. When two consecutive readings for smallest size coarse aggregate differ by more than 1.0 percent, frequency of testing shall be increased to that specified previously for fine aggregate.

- d. Coarse Aggregate Moisture Corrective Action - Whenever the moisture content of any size of coarse aggregate changes by 0.5 percent or more, the scale setting for the coarse aggregate batcher and the water batcher shall be adjusted to compensate for this.
- e. Particle Shape Testing - When directed, a problem exists in connection with aggregate particle shape, tests shall be made in accordance with ASTM D 4791. Testing frequency shall be not less than one per day, when directed.
- f. Particle Shape Corrective Action - When testing for particle shape is required, two consecutive failures in the same sieve size shall be immediately reported, who shall determine what corrective action is needed.
- g. Material Finer than the No. 200 Sieve - When in the opinion of the Contracting Officer, a problem exists in connection with the cleanliness of aggregate, tests shall be made in accordance with ASTM C 117. Testing frequency shall be as directed.
- h. Corrective Action for Material Finer than the No. 200 Sieve - When material finer than the No. 200 sieve exceeds 1.0 percent of the weight of the aggregate finer than 1-1/2 inches or 0.5 percent of the weight of the aggregate coarser than 1-1/2 inches, the Contracting Officer shall be notified and steps, such as washing or other corrective action, shall be initiated immediately.

3.8.2.3 Quality of Aggregates

- a. Frequency of Quality Tests - Prior to submitting samples for mixture proportioning studies and 30 days prior to the start of concrete placement, the Contractor shall perform the tests for aggregate quality in the following list. In addition, after the start of concrete placement, the Contractor shall perform tests for aggregate quality in accordance with the following frequency schedule. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

PROPERTY	FREQUENCY		TEST
	FINE AGGREGATE	COARSE AGGREGATE	
Specific Gravity	Every 3 months	Every 3 months	ASTM C 127 ASTM C 128
Absorption	Every 3 months	Every 3 months	ASTM C 127 ASTM C 128
Clay Lumps and Friable Particles	Every 3 months	Every 3 months	ASTM C 142
Material Finer than the No. 200			

PROPERTY	FREQUENCY		TEST
	FINE AGGREGATE	COARSE AGGREGATE	
Sieve	Every 3 months	Every 3 months	ASTM C 117
Organic Impurities	Annually	Not applicable	ASTM C 40
L.A. Abrasion	Not applicable	Every 6 months	ASTM C 131 ASTM C 535

- b. Corrective Action for Aggregate Quality - If the result of a quality test fails to meet the requirements for quality during submittal of samples for mixture-proportioning studies or immediately prior to start of concrete placement, production procedures or materials shall be changed and additional tests shall be performed until the material meets the quality requirements prior to proceeding with either mixture-proportioning studies or starting concrete placement. After concrete placement commences, whenever the result of a test for quality fails the requirements, the test shall be rerun immediately. If the second test fails the quality requirement, the fact shall be reported and immediate steps taken to rectify the situation.

3.8.2.4 Scales

- a. Weighing Accuracy - The accuracy of the scales shall be checked by test weights at least once a month for conformance with the applicable requirements of paragraph: EQUIPMENT. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors.
- b. Batching and Recording Accuracy - Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. The Contractor shall confirm that the calibration devices described in paragraph: EQUIPMENT for checking the accuracy of dispensed admixtures, are operating properly.
- c. Scales Corrective Action - When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

3.8.2.5 Batch-Plant Control

The measurement of all constituent materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water

weights per cubic yard for each class of concrete batched during plant operation.

3.8.2.6 Concrete

- a. Slump Testing - At least two slump tests shall be made in accordance with ASTM C 143 on each concrete mixture produced during each 8-hour period or less of concrete production each day. Additional tests shall be made when excessive variation in workability is reported. The result of each test for each mixture shall be plotted on a control chart on which the upper and lower limits are set as specified in paragraph: MIXTURE PROPORTIONING. The range shall be plotted on a control chart on which the upper control limit is 2 inches. Samples for slump shall be taken at the mixer, however the Contractor is responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between the mixer and the placement, samples shall be taken at the placement site as often as required by the Contracting Officer.
- b. Slump Corrective Action - Whenever points on the control chart approach the upper or lower control limits, an adjustment shall be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount specified in the mixture proportions provided based on the free water available with the aggregates and that amount of water batched. If the adjustments to the batch weights of water and aggregates do not satisfactorily produce the required slump, the Contracting Officer may adjust the mixture proportions if the fine-aggregate moisture content is stable and within the required limits. When a single slump is outside the control limits, such adjustment is mandatory. As soon as practical after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive individual slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range above the upper control limits, the slump shall be considered to be out of control, the concreting operation halted, and the additional testing for aggregate moisture content required shall be undertaken, and action taken immediately to correct the problem.
- c. Air Content - At least two tests for air content shall be made on randomly selected batches of each concrete mixture produced during each 8 hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported. Tests shall be made in accordance with ASTM C 231. The average of each set of two tests for each mixture shall be plotted on control charts on which the average percent and upper and lower limits are set in accordance with paragraph MIXTURE PROPORTIONING for each NMSA. The range between two consecutive tests for each mixture shall be plotted on a control chart on which the upper control limit is 3.0 percent. Samples for air content shall normally be taken at the mixer, however the Contractor is responsible for delivering the concrete to the forms at the proper air content. Samples shall be taken at the placement site as often as required, depending on the Contractors delivery method, to determine any air loss.

- d. Air Content Corrective Action - Whenever points on the control chart approach the upper or lower control limits, an adjustment should be made in the amount of air-entraining admixture batched. If a single test result is outside the specification limit, immediate adjustment is mandatory. As soon as practical after each adjustment, another test shall be made to verify the correction of the adjustment. Whenever a point falls above the upper control for range, the dispenser shall be calibrated to ensure that it is operating correctly and with good reproducibility. Whenever two consecutive points either for average or range are outside the control limits, the Contracting Officer shall be notified.

3.8.2.7 Inspection Before Placing

Foundation or construction joints, forms, and embedded items shall be inspected by the Contractor in sufficient time prior to each concrete placement in order to certify that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.8.2.8 Concrete Placement

- a. Placing Inspection - The placing foreman shall supervise all placing operations, shall determine that the correct quality of concrete or grout is placed in each location as directed, and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, yardage placed, and method of placement.
- b. Placing Corrective Action - The placing foreman shall not permit placing to begin until he has verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

3.8.2.9 Vibrators

- a. Vibrator Testing and Use - The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined while the vibrator is operating in concrete with the tachometer being held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head, and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing.
- b. Vibrator Corrective Action - Any vibrator not meeting the requirements of paragraph: PREPARATION FOR PLACING shall be

immediately removed from service and repaired or replaced.

3.8.2.10 Curing

- a. Moist Curing Inspections - At least twice each shift, and twice per day on nonwork days an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.
- b. Moist Curing Corrective Action - When a daily inspection report lists an area of inadequate moistness, immediate corrective action shall be taken, and the required curing period for those areas shall be extended by one (1) day.
- c. Membrane Curing Inspection - No curing compound shall be applied until the Contractor's authorized representative has verified that the compound is properly mixed and ready for spraying. At the end of each operation, he shall estimate the quantity of compound used by measurement of the container and the area of concrete surface covered and compute the rate of coverage in square feet per gallon. He shall note whether or not coverage is uniform.
- d. Membrane Curing Corrective Action - When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.
- e. Sheet Curing Inspection - At least once each shift and once per day on nonwork days, an inspection shall be made of all areas being cured using sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.
- f. Sheet Curing Corrective Action - When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by one (1) day.

3.8.2.11 Cold Weather Protection and Sealed Insulation Curing

At least once each shift and once per day on nonwork days an inspection shall be made of all areas subject to cold weather protection. The protection system shall be inspected for holes, tears, unsealed joints, or other incongruities which could result in damage to the concrete. Special attention shall be taken at edges, corners, and thin sections. Any deficiencies shall be noted, corrected, and reported.

3.8.2.12 Cold Weather Protection Corrective Action

When a daily inspection report lists any holes, tears, unsealed joints, or other incongruities, the deficiency shall be corrected immediately and the period of protection extended for one (1) day.

3.8.2.13 Mixer Uniformity

Prior to the start of concrete placing and once every 3 months when concrete is being placed, or once for every 75,000 cubic yards of concrete placed, whichever results in the longest time, interval uniformity of concrete mixing shall be determined in accordance with paragraph: EQUIPMENT. The initial and every fourth set of tests shall be regular tests

performed on three batches of concrete. Intermediate uniformity tests shall be abbreviated tests performed on a single batch of concrete. If the mixer fails the abbreviated test, a regular test shall be immediately performed. Whenever adjustments in a mixer or increased mixing time are required because of failure of a uniformity test, the mixer shall be reevaluated by a regular test after the adjustments have been completed. If the Contractor proposes to reduce a mixing time, a regular test shall be performed to evaluate the proposed time. Additional testing shall be performed when directed when there is visible evidence of possible improper mixer performance. Results of all uniformity tests shall be reported in writing.

3.8.2.14 Mixer Uniformity Corrective Action

When a mixer fails to meet mixer uniformity requirements, either the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

3.8.3 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all contractor quality control records.

-- End of Section --

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